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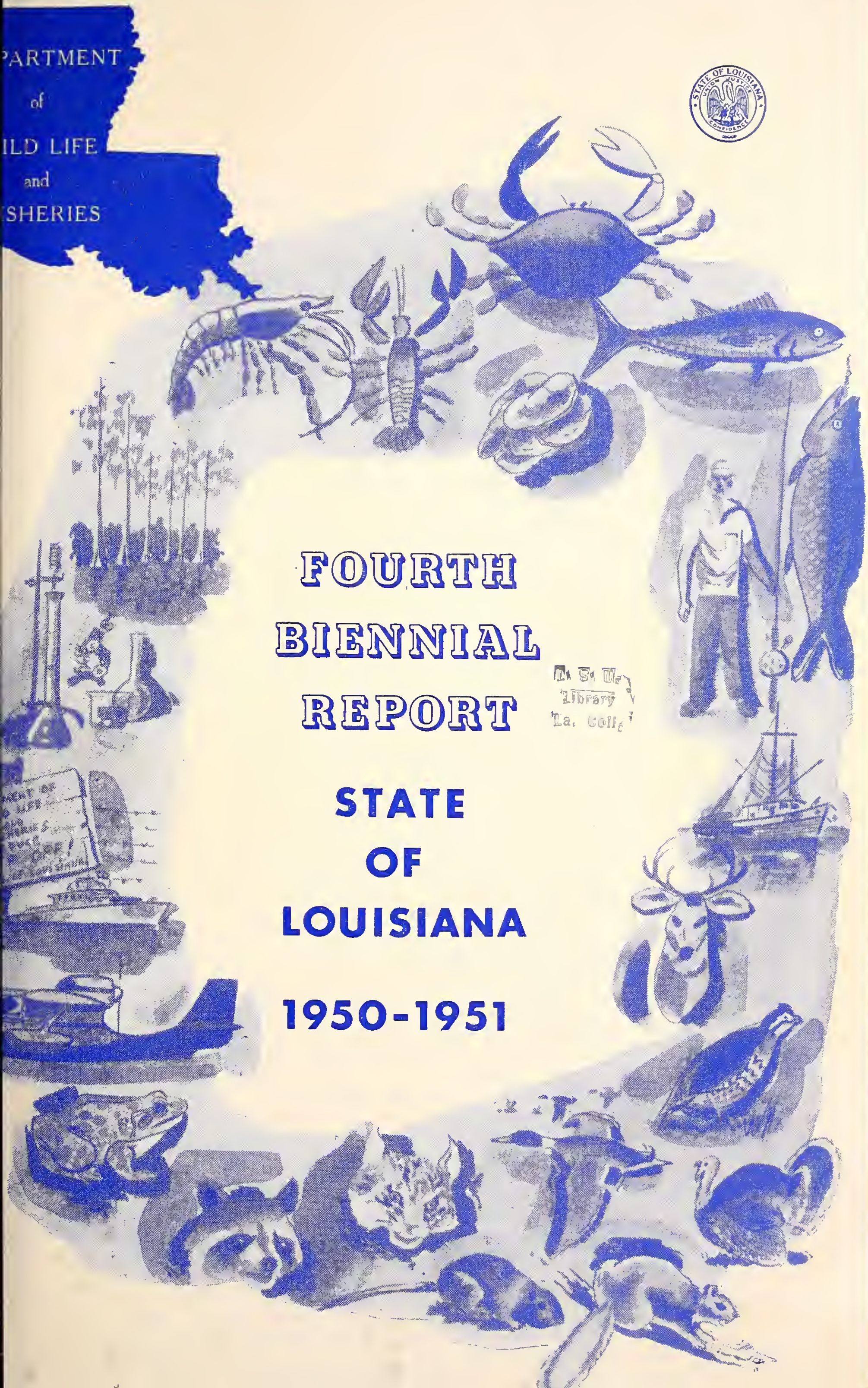

FOURTH BIENNIAL REPORT

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STATE OF LOUISIANA

1950-1951

Fourth Biennial Report

DEPARTMENT
of
WILD LIFE and FISHERIES

STATE OF LOUISIANA

1950-1951

Published by
DEPARTMENT OF WILD LIFE AND FISHERIES
126 Civil Courts Building
1952

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Edited and compiled by
Mel Washburn, Director,
Division of Education and Publicity.

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DEPARTMENT OF WILD LIFE AND FISHERIES
STATE OF LOUISIANA

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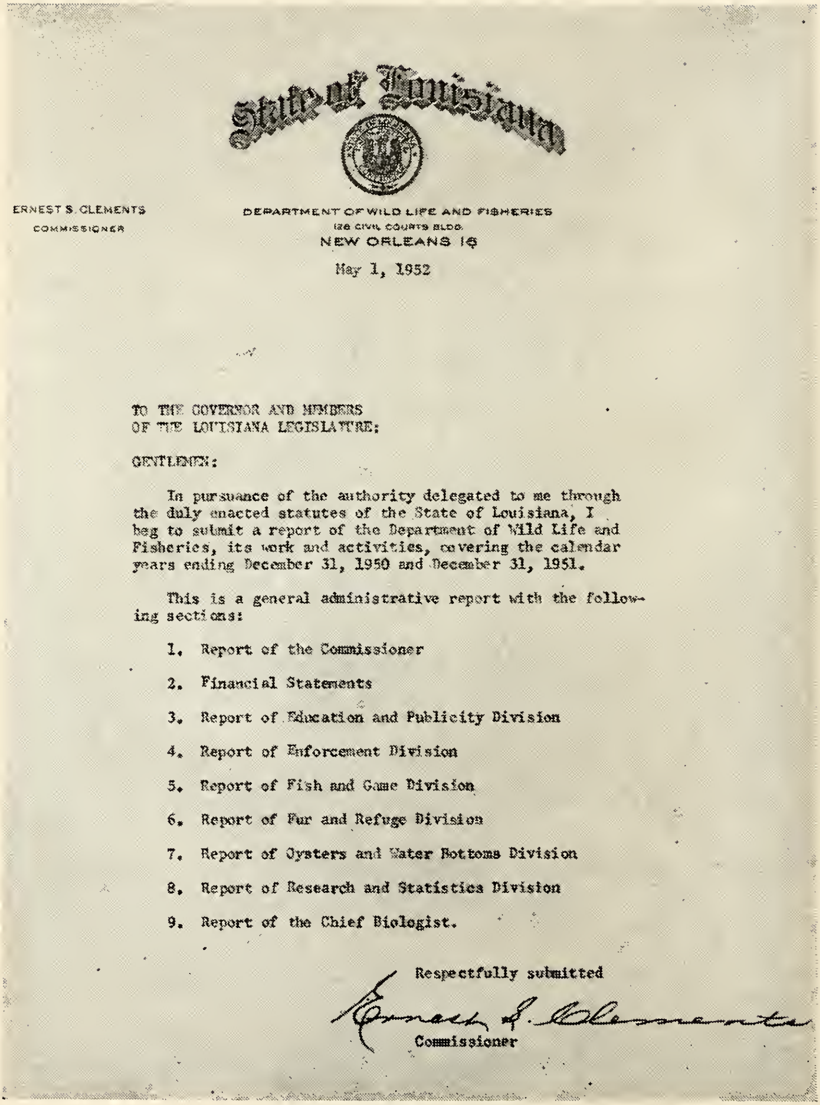
LETTER OF TRANSMITTAL



State of Louisiana

ERNEST S. CLEMENTS
COMMISSIONER

DEPARTMENT OF WILD LIFE AND FISHERIES
126 CIVIL COURTS BLDG.
NEW ORLEANS 16

May 1, 1952

TO THE GOVERNOR AND MEMBERS
OF THE LOUISIANA LEGISLATURE:

GENTLEMEN:

In pursuance of the authority delegated to me through the duly enacted statutes of the State of Louisiana, I beg to submit a report of the Department of Wild Life and Fisheries, its work and activities, covering the calendar years ending December 31, 1950 and December 31, 1951.

This is a general administrative report with the following sections:

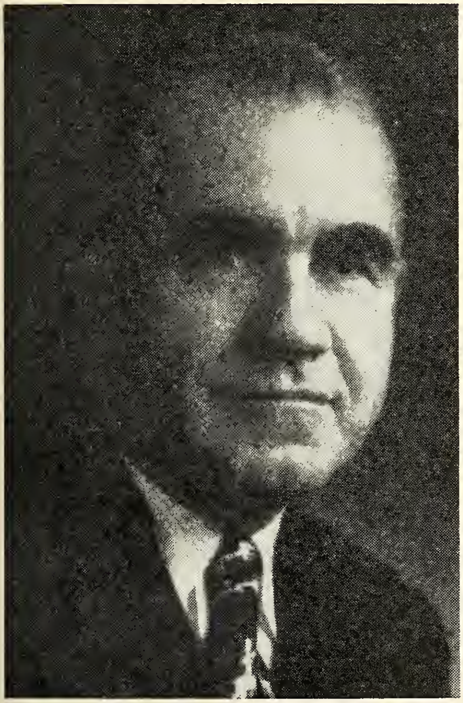
1. Report of the Commissioner
2. Financial Statements
3. Report of Education and Publicity Division
4. Report of Enforcement Division
5. Report of Fish and Game Division
6. Report of Fur and Refuge Division
7. Report of Oysters and Water Bottoms Division
8. Report of Research and Statistics Division
9. Report of the Chief Biologist.

Respectfully submitted

Ernest S. Clements
Commissioner

REPORT OF ERNEST S. CLEMENTS, COMMISSIONER, DEPARTMENT OF WILDLIFE AND FISHERIES

New Orleans, La.
May 1, 1952



Ernest S. Clements

THE Department of Wild Life and Fisheries was created on December 11, 1944, when voters of Louisiana approved an Amendment to the State Constitution in the general election of November, 1944, to make three separate and independent state departments out of the former Department of Conservation. This Department was charged with the responsibility of protecting, conserving and propagating the wildlife of Louisiana, including wild game and nongame quadrupeds or animals, game, oysters, fish and other aquatic life.

The Department of Wild Life and Fisheries has seven divisions, each administered by a Director, responsible to the Commissioner, and each entrusted with responsibility of carrying on certain activities. The divisions are as follows:

1. Administration
2. Education and Publicity
3. Enforcement

4. Fish and Game
5. Fur and Refuge
6. Oysters and Water Bottoms
7. Research and Statistics

Considerable progress in all phases of wildlife conservation has been made in Louisiana during the period covered by this biennial report. Details of this progress will be found in the reports of the various divisions.

Several Pittman-Robertson scientific projects have been completed and others were inaugurated during the biennium. A water hyacinth elimination program, for which the 1948 Legislature made a special appropriation, has made good progress and a concerted effort has been under way to eliminate this pest. Details of the results will be found in the report of the Fish and Game Division.

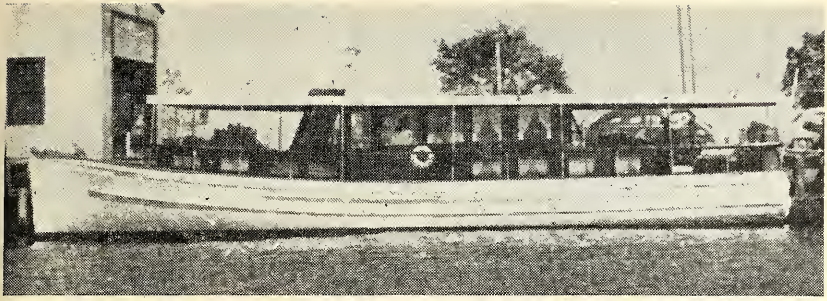
The State of Louisiana leads the nation in the production of raw furs. This is due greatly to the fact that the production of muskrat fur is greater in Louisiana than in all the remainder of America. The annual fur crop is now greater enhanced by a new fur bearer, the nutria or coypu, which has made amazing progress in this state during the last decade. Because of the rapidly increasing popularity of nutria as a commercial fur bearer, this Department has begun the transplanting of these animals to other localities within the boundaries of the state where suitable habitat will insure their future. It has been conservatively estimated that within another 10 years the nutria fur crop will exceed all others in value in Louisiana, and consequently, considerable work is being done by this Department to aid in the development of this new wealth.

Our game and refuge preserves have been improved during the period covered by this report and 12 new game preserves now have been established.

Work is now going ahead for the establishment of more such game refuges in other areas of the state where habitat is suitable for the maintenance of game and game bird colonies.

We have made headway in oyster and shrimp research and in other phases of our wildlife conservation program.

In addition, another fish rescue crew has been established, greatly augmenting the success of the fish and game division's fish rescue program.

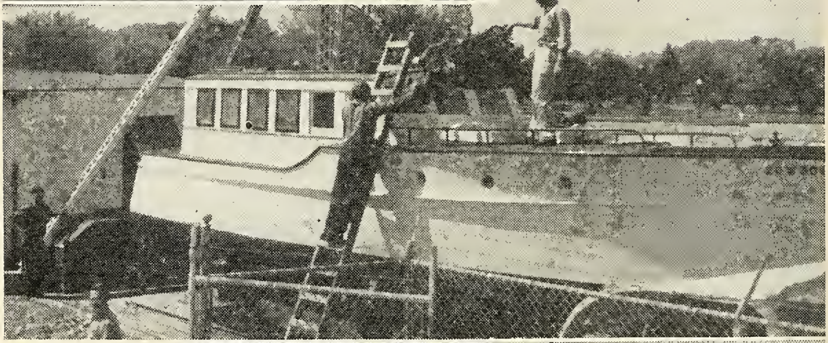


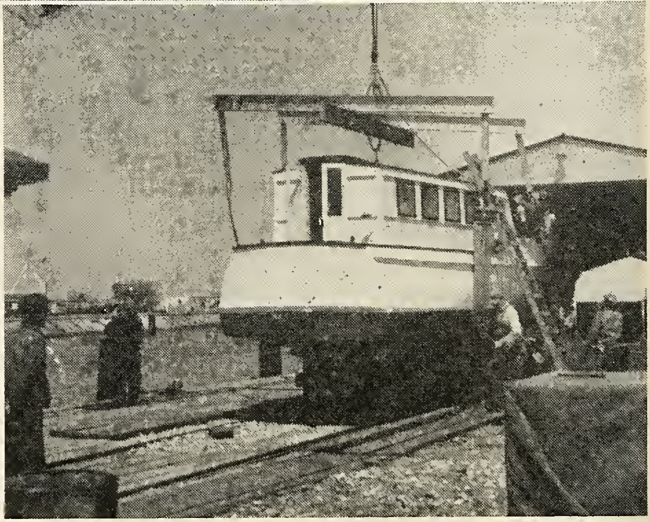
"The Zoric," flagship of the fleet of the Department of Wild Life and Fisheries boats.

When I became head of this Department an inventory quickly revealed a condition that was disheartening and critical. Physical assets had been permitted to "go to pot"; no effort apparently had been exercised to replenish the dwindling fish and game population of this state; no thought apparently had been given to the future welfare of Louisiana's once fabulous wealth in wildlife resources, and no planning for the future had been attempted. It was at once apparent that drastic steps were needed if Louisiana's fish and game were to survive, but first of all, a complete renovation of boats, camps and other assets was important, and a sensible, practical, and economic program for restocking our fish and game was the main hope that future generations in Louisiana would have something to hunt and fish.

Work was immediately begun on the fleet of boats maintained by the Department for law enforcement, patrol service, and in other divisions, such as the Oyster Division, Fish and Game Division, and Fur and Refuge Division. Some boats that were considered antiquated, dangerous and beyond repair were junked. Two new patrol boats, the Nutria and the Zoric were purchased and put into service. The old Tarpon, found to have a hull in splendid condition, was stripped to the ribs and completely rebuilt and is just now ready to go into service as one of the finest boats of its kind in all Louisiana waters. Dozens of other smaller boats have been overhauled and repaired and are now in splendid condition and the great majority of all of this restoration work has been done by workmen at our own wharf at a great saving in repair cost. It was found possible to buy high powered outboard motors at a saving of approximately $150.00

Left and below. Boat being worked on at department wharf.



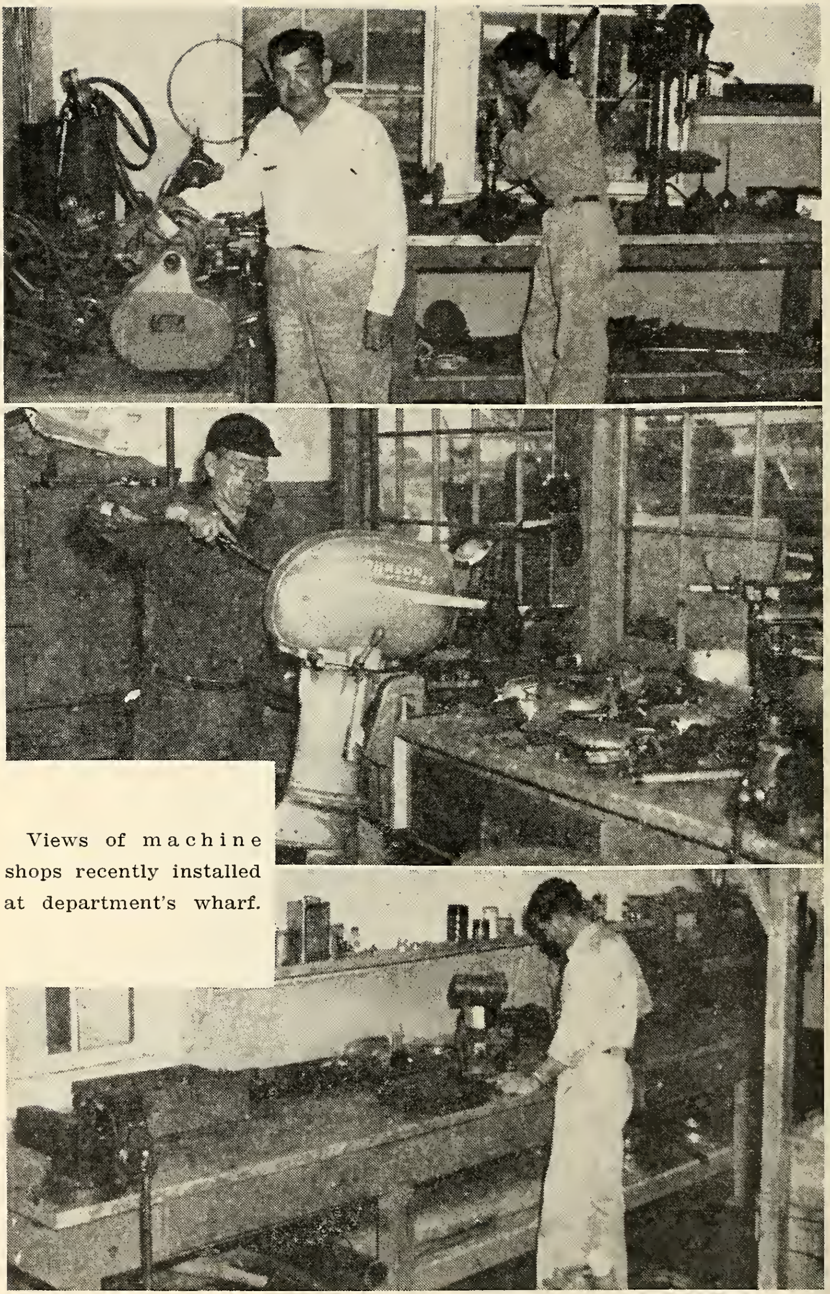


Boat coming out of repair shop after overhaul job.

each, from wholesale dealers instead of patronizing the dealers who had been supplying this type of equipment in the past. In similar manner other economies were effected and the marine equipment of the Department was restored to an A-1 condition.

In one instance it was found that one of the more prominent boats in the patrol fleet of the Enforcement Division did not belong to the Department of Wild Life and Fisheries, although it had been in use by this agency for many years. This boat known as the "Black Mallard" was seized a great many years ago by prohibition agents when it was found to be transporting a load of, then, illegal liquor in Louisiana waters. Soon after its seizure it was loaned to the Department of Wild Life and Fisheries to be used in a biological shrimp survey, and since that time has been one serviceable unit of the Enforcement Division. During the course of scrutiny given every boat in our fleet, it was revealed that the U. S. Government still retained title to the "Black Mallard" although considerable sums of money had been spent from time to time by this Department in its repair and maintenance. Steps were immediately taken to have Congress enact a bill giving the Department of Wild Life and Fisheries of Louisiana correct title to the "Black Mallard" and the bill was eventually signed by the President, thus adding another valuable unit to the Enforcement Division's assets.

While all of this work was in progress the City of New Orleans and the State of Louisiana began closing the West End Canal on which the Department's wharf, just below City Park avenue, was located and it was necessary to purchase a new site. A suitable location was found near the mouth of the canal at Lake Ponchartrain and the purchase was effected and the wharf moved. Considerable work was necessary for the conversion of this location into the type of wharf the Department needed, and again all of this work was done by the employees of this Department at a considerable saving to the state. At the present time we have one of the most complete facilities for docking, repairing, and rebuilding of all types of floating craft in the south. It was even found possible to convert what had formerly been a store-room on the second floor of the new wharf building into a modern, comfortable and clean dormitory, which is now being used by the Department employees from all parts



Views of machine shops recently installed at department's wharf.

of the state who visit New Orleans periodically in the transaction of their normal business, again saving the state money that would normally be charged to hotel expense by these visitors.

In conjunction with the restoration of the Department's boat and wharf facilities and as a furtherance of our law enforcement program, a short wave radio installation has been completed so that now all the major boats of the patrol fleet are in constant touch with the wharf, the office of the enforcement director, each of our fleet of our airplanes, and several of the Department's automobiles used by our enforcement agents. So effective has this radio addition to our law enforcement facilities become, that recently a staff writer for the "Saturday Evening Post" selected this Department as outstanding in all the United States, and a story in that publication is soon to be printed featuring our complete patrol facilities with attendant pictures to amplify the story.

A great number of our camps used by the oyster, fisheries, and fur and refuge division, have been either rebuilt or abandoned and new ones erected in their stead. Each of these new camps is as modern as it is possible to make them; they are comfortably furnished and have the most modern facilities possible to obtain.

While all this restoration work had been in progress, our fish and game restocking program was begun in 1948 and has been proceeding as rapidly as possible. At the outset it was apparent that the liberation of new fish and game in Louisiana was not the solution of our rapidly dwindling fish and game assets. Accordingly plans were made for the establishment of wildlife refuges, in strategic areas throughout Louisiana, that could serve as incubators for our furred and feathered replacements. In due course twelve game refuges have been established. Among them are the preserves at West Bay in Allen Parish; the Red Dirt Refuge in Vernon Parish, the Evangeline Refuge in Rapides Parish, the Sabine Refuge in Sabine Parish, the Catahoula Refuge in Grant and Winn Parishes, the Caldwell Refuge in Caldwell Parish, the Union Refuge in Union Parish, the Livingston Refuge in Livingston Parish, the Jackson and Bienville Refuge, the Starks Refuge, the Jena Refuge near Jena, the Hardtner Refuge and the Zemurray Refuge which has been established on the Zemurray Estate. As soon as these game sanctuaries became a fact, game management experts were established as superintendents, and enforcement regulations arranged to protect the game with which these areas were restocked. Working in conjunction with the Pittman-Robertson Division of the Federal U. S. Fish and Wildlife Service in Louisiana, these refuges are now flourishing incubators from which the future game assets of Louisiana will come.

To date we have released approximately 122,000 quail throughout the state, 4,000 wild turkeys, more than 900 deer, 500 squirrels and approximately 8,000,000 fish. It was found more economical and more practical to purchase four-months-old quail for liberation, than to attempt complete hatchery grown birds. Thus Louisiana's bird hunters, during the last two years in particular, have noted an amazing increase in quail population and have found the birds they bagged were of a larger, hardier variety. This has no doubt been due to the infusion of new blood in the native coveys of Louisiana's bobwhite. Proof that our quail restocking program has been successful is found by the sportsmen themselves, who have found banded birds along with the unbanded ones they killed throughout the state. Although no concerted survey has been attempted, game management experts and veteran bird hunters have estimated that approximately 85% of the quail liberated in this restocking program have survived to maturity.

Replenishing the deer population in Louisiana, especially in certain areas, has had apparently equally successful results and this has been accomplished at a great saving in the customary cost of such a venture. Through an arrangement with the Fish and Game Commission of Texas, we have been able to secure 290 deer from the Aransas Pass Refuge by paying only the cost of trapping and transportation at a saving of approximately $29,000.00. Deer were purchased in Wisconsin for liberation here, and a considerable number were live trapped in privately owned areas, such as the Shadow Estate in Lincoln Parish, and the Schleter estate near Manchac. A number of deer were also trapped on Marsh Island and released in other areas. At the present time we are continuing to trap deer in overstocked areas for release elsewhere in the state.

Since this restocking program began we have released approximately 500 gray squirrels purchased in Wisconsin, into areas where the squirrel population in Louisiana had become virtually nil. The purchase and release of Wisconsin squirrels not only added to the squirrel population of this state, but it again provided new blood that will in the future greatly improve our bushy tail family.

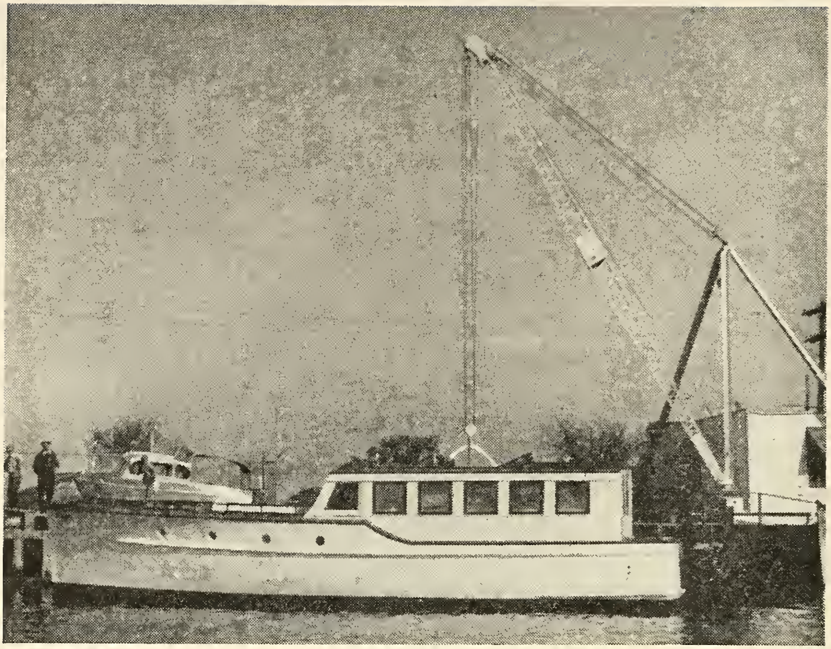
While all this game restocking has been in progress a predator control unit has been working diligently to safe-guard our imported stock. When I became head of this Department three men comprised the predator control personnel. Now we have 13, all of them veteran and capable trappers, who during the past 3½ years have captured hundreds of bob-cats, scores of wolves, wild dogs, raccoons, snakes, hawks, eagles and other predators who prey on our game assets. So effective has the work of this predator trapping unit become that there is seldom found any evidence now of predatory activities in our game sancturaries.

Our fish rescue work has been kept apace with our game program. In May, 1948, there was one fish rescue crew working in our fish and game division, and they had but two thermal trucks suitable for the safe transportation of rescued fish. Since that time another complete crew has been added and four additional thermal trucks have been purchased.

As a result approximately 8,000,000 game fish (bass, and perch) have been rescued from barrow pits, stream overflow areas, and our own fish hatcheries for liberation in our lakes, streams and bayous.

In the commercial fisheries divisions of this Department equally progressive methods have been put in effect. Many new oyster reefs have been established and regulations executed for their protection. A newly invented oyster harvester was purchased that has made it possible to reclaim for seeding purposes, hundreds of thousands of barrels of oysters and oyster shell, at an amazing reduction in cost. These reefs are being protected for the future of the oyster industries, and regulations governing the taking of oysters have been established to insure an annual harvest of greatly increased value to the oyster fisherman.

Similar conditions now prevail in the shrimp industry. At the outset, it was determined that more rigid regulations were needed to protect Louisiana's annual crop of shrimp as far as it was within the power of this Department. Conditions looking



Huge crane, recently installed at the wharf of the Department of Wild Life and Fisheries, ready to hoist a boat from the water to the ways for repair.

to the future as well as the present harvest were established. Spawning waters were closed when necessary and open seasons were curtailed when it was thought advisable. As a result the past year's shrimp harvest has been the greatest in the history of Louisiana.

In the fur industry a great loss has been suffered during the last several years due principally to adverse weather conditions and disease among the marketable fur bearing animals. As an antedote accredited biologists have been put to work to study these conditions and, if possible, recommend a solution. While the muskrat industry has suffered appreciably, it has been noted that the nutria has continued a steady increase in population. As a result it has been deemed advisable to further distribute the nutria throughout the state and for more than a year live trapping of these animals has been in progress. Nutria have been transplanted to the Pass-a-Loutre Game Preserve area on the east side of the mouth of the Mississippi River, and in the

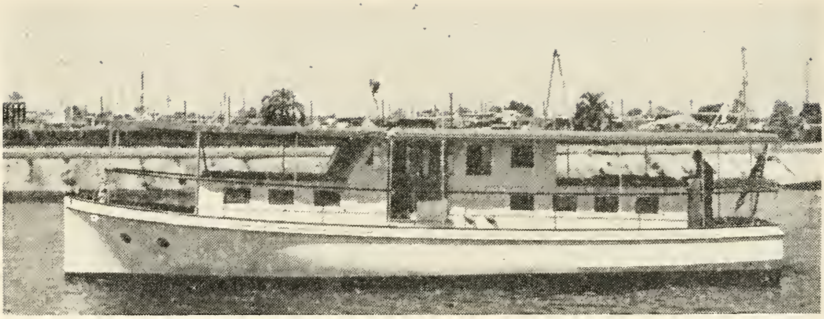
Mandeville-Manchac areas, and it is not beyond the realm of possibility that within the next 10 years the value of the nutria fur harvest in Louisiana will far exceed any and all other of Louisiana's fur crop.

Although our Division of Education and Publicity has been responsible for a great amount of national publicity for this Department through movies for television, featured stories in some of the world's most popular sports and outdoor life magazines, and similar activities, one thing stands out above all others in this division. In September, 1948, we inaugurated the *Louisiana Conservationist,* a magazine dedicated to the furtherance of our wildlife resources. Since that time it has become one of the four leading conservation magazines in America and it has grown in circulation from an original 6,200 copies to its present mailing list of 42,500. We have received literally thousands upon thousands of letters of commendation from the fishermen and hunters of Louisiana on the excellence of this magazine and also from the members of the various wildlife and sportsmen's clubs of this state. Every accredited member of these organization is placed on our mailing list to receive this publication without charge.

Considerable time and effort has been spent in the renovation of our natural wildlife museum in the old Presbytere Building in New Orleans, and today we have one of the outstanding displays in the nation, of migratory game birds as well as all other species of fish and game native to this state and its Gulf of Mexico Coast.

The law enforcement division of this Department which has constantly been bludgeoned by critics has also established its record during this administration. The number of arrests of fish and game law violators has been greater during the past three years than in any other similar peroid in the history of this Department, and this has been done without the alleged considerably increased personnel. In fact, and with all accusations to the contrary, there has been a definite improvement in law enforcement throughout the state.

New laws sponsored, by this administration, have been passed by the State Legislature, and have added greatly in assisting our enforcement division. In conclusion I would recommend that the only tenable solution for better enforcement



The new patrol boat "Tarpon"

of our fish and game laws must come through more new laws that will make punishment of violators mandatory. When persistent violators are either dismissed or given ridiculously low fines in our courts, there is little to deter the temptation of game or fish hogs, and when severe penalties, both in fines and jail sentences, become mandatory, the violators will constantly diminish in number, and game wardens will take new heart in their work.

I wish to take this means of thanking the sportsmen of Louisiana for their cooperation in making possible real progress in conservation in this State.

I believe it is a recognized fact that Louisiana has made definite progress in wildlife conservation during the past two years. The reports of the various divisions detailing this progress speak for themselves.

Sincerely yours,

ERNEST S. CLEMENTS,
Commissioner

DEPARTMENT OF WILD LIFE & FISHERIES

FINANCIAL STATEMENTS FOR THE FISCAL YEARS 1950-1951 AND 1951-1952

1. Operating Account
2. Fur and Refuge Account
3. Oyster Seed Ground Account
4. Marsh Island Improvement Fund Account
5. Dedicated Funds
   (Act 22 of 1946)
6. Civil Fees for Law Violations
7. Hyacinth Control
   (Act 89 of 1950)
8. Purchase or Construction of New Boats
   (Act 97 of 1950)
9. Turkey Creek Dam and Fish Preserve
   (Act 151 of 1950 Board of Liquidation 2/27/51)
10. Loutre Preserve Dam
    (Act 185 of 1948

OPERATING ACCOUNT

Means of Financing:	Actual 1950-1951	Estimated 1951-1952
State Appropriation	$1,215,147.00	$1,213,449.00
Pittman-Robertson Federal Projects:		
State Appropriation 25%	50,000.00	50,000.00
Federal Allotment 75%	150,000.00	150,000.00
	$1,415,147.00	$1,413,449.00

Revenue Collections for the account of the Louisiana State Treasury:	Actual 1950-1951	Estimated 1951-1952
Severance Tax		
Gravel	$ 87.61	$ 100.00
Sand	1,748.00	1,800.00
Skins, Hides and Furs	54,680.28	20,000.00
Oyster Privilege	13,211.86	14,000.00
Shrimp	64,986.50	70,000.00
Frogs	854.18	1,000.00
	568.43	
Licenses		
Angling Licenses	107,771.72	109,700.00
Hunting Licenses	226,543.77	232,700.00
Hunting Club	1,155.22	1,200.00
Commercial Fishermen, Bait Sellers	3,750.00	3,500.00
Hoop Net	6,830.00	6,500.00
Fresh Water Commercial Seine	2,680.00	2,500.00
Fresh Water Commercial Tram Net	2,130.00	2,000.00
Fresh Water Commercial Gill Net	7,175.00	7,000.00
Commercial Salt Water Fish Seine	485.00	400.00
Commercial Salt Water Fish Trammel Net	1,330.00	1,000.00
Wholesale Fish Dealers	16,250.00	15,000.00
Wholesale Fish Dealers Agent	1,180.00	1,000.00
Retail dealers Fish and Seafood	12,710.00	14,000.00
Oyster Vessel Tonnage	1,228.00	1,300.00
Salt Water Fish Vessel	345.00	300.00
Salt Water Shrimp Vessel	14,860.00	13,500.00
Oyster Dredging	7,050.00	7,000.00
Salt Water Shrimp Trawl	25,260.00	22,000.00
Salt Water Shrimp Seine "Menhaden"	1,150.00	1,200.00
Shrimp Freight or Ice Boats	2,160.00	1,800.00
Breeders for Private Bird and Animal Preserves	490.00	500.00
Trappers	14,294.18	10,600.00
Resident Fur Buyers	5,800.00	5,000.00
Resident Fur Dealers	5,550.00	5,000.00
Non Resident Fur Buyers	100.00	100.00
Non Resident Fur Dealers	600.00	300.00
Bedding Ground	37,496.00	38,000.00
Oyster Shop, Resale Canning-Steam Box	815.00	800.00
Releasing Lien Fees	41.00	50.00
Camping Licenses	149.60	100.00
	379.49	
Miscellaneous		
Refunds by Sheriff and Tax Collectors	11.00	10.00
Leases and Royalties from Mineral Leases dedicated to Conservation	1,008,773.53	500,000.00
	$1,651,732.45	$1,110,960.00

Analysis of Expenditures by Units:

DIVISION OF ADMINISTRATION

Class of Expenditures:	Actual 1950-51	Estimated 1951-52
Salaries	$ 68,090.94	$ 72,760.00
Contractual Services	25,511.20	27,500.00
Traveling Expenses	8,770.03	9,500.00
Materials and Supplies	10,353.64	11,000.00
Special Current Charges	3,702.60	4,000.00
Equipment—Capital Outlay	—533.47	500.00
Grand Total of Expenditures	$115,894.94	$125,260.00

DIVISION OF EDUCATION AND PUBLICITY:

Class of Expenditures:	Actual 1950-51	Estimated 1951-52
Salaries	$ 18,230.00	$ 18,540.00
Contractual Services	35,247.49	44,327.00
Traveling Expenses	895.74	1,500.00
Materials and Supplies	1,387.86	3,615.00
Special Current Charges	1,025.70	1,380.00
Equipment—Capital Outlay	2,963.05	2,060.00
Grand Total of Expenditures	$ 59,749.84	$ 71,422.00

DIVISION OF RESEARCH AND STATISTICS:

Class of Expenditures:	Actual 1950-51	Estimated 1951-52
Salaries	$ 25,036.17	$ 27,350.00
Contractual Services	1,381.72	1,582.00
Traveling Expenses	7,204.54	7,500.00
Materials and Supplies	2,501.59	1,560.00
Special Current Charges	1,197.00	1,200.00
Equipment—Capital Outlay	1,937.75	1,575.00
Grand Total of Expenditures	$ 39,258.77	$ 40,767.00

DIVISION OF ENFORCEMENT:

Class of Expenditures:	Actual 1950-51	Estimated 1951-52
Salaries	$329,480.49	$340,000.00
Contractual Services	17,880.59	17,800.00
Traveling Expenses	127,869.23	133,300.00
Material and Supplies	35,289.03	30,250.00
Special Current Charges	15,167.69	17,000.00
Equipment—Capital Outlay	15,920.54	18,500.00
Grand Total of Expenditures	$541,607.57	$556,850.00

DIVISION OF OYSTER AND WATER BOTTOMS:

Class of Expenditures:	Actual 1950-51	Estimated 1951-52
Salaries	$ 29,921.70	$ 33,180.00
Contractual Services	10,474.69	15,708.00
Traveling Expenses	6,764.34	6,200.00
Material and Supplies	12,922.33	16,655.00
Special Current Charges	10,065.36	9,900.00
Equipment—Capital Outlay	2,662.91	1,000.00
Construction	2,135.23	....
Grand Total of Expenditures	$ 74,946.56	$ 86,643.00

DIVISION OF FISH AND GAME:	Actual 1950-51	Estimated 1951-52
Class of Expenditures:		
Salaries	$ 87,583.30	$107,400.00
Contractual Services	19,530.40	19,290.00
Traveling Expenses	19,146.41	22,000.00
Materials and Supplies	36,486.69	36,439.00
Special Current Charges	3,326.06	5,904.00
Equipment—Capital Outlay	110,998.95	182,203.00
Major Repairs	414.50	2,500.00
Construction	....	2,000.00
Grand Total of Expenditures	$277,486.31	$377,736.00
DIVISION OF PITTMAN-ROBERTSON:		
Class of Expenditures:		
Salaries	$ 100,721.04	$ 142,000.00
Contractual Services	15,831.66	35,000.00
Traveling Expenses	10,144.64	20,000.00
Material and Supplies	41,066.36	77,000.00
Special Current Charges	3,881.52	6,000.00
Equipment—Capital Outlay	45,444.00	100,000.00
Major Repairs	....	10,000.00
Construction	....	46,373.64
Grand Total Expenditures	$ 217,089.22	$ 436,373.64
Grand Total of Expenditures Operating Account	$ 1,326,033.21	$ 1,691,051.64

FUR AND REFUGE ACCOUNT

Means of Financing:

Dedicated Revenues to the propagation and protection of preserves:		
Sale of Furs	$ 28,603.15	$ 11,000.00
Sale of Alligator Skins	538.33	600.00
Rental of Unimproved Lands—Pasture	1,957.00	2,000.00
Right of Way Agreement	3,046.00	....
Mineral Leases	111,824.05	....
	$ 145,968.53	$ 13,600.00
Cash Balance Fiscal Year Ending June 30, 1950	$ 95,442.42	
Revenue Fiscal Year Ending June 30, 1951	145,968.53	
	$ 241,410.95	
Expenditures Fiscal Year Ending June 30, 1951	74,493.95	
	$ 166,917.00	
Estimated Revenue Fiscal Year Ending June 30, 1952	13,600.00	
	$ 180,517.00	
Estimated Expenditures Fiscal Year Ending June 30, 1952	86,600.00	
Unencumbered Balance June 30, 1952 estimated	$ 93,917.00	

Analysis of Expenditures:

Class of Expenditures:	Actual 1950-51	Estimated 1951-52
Salaries	$ 41,979.75	$ 47,750.00
Contractual Services	5,082.43	5,000.00
Traveling Expenses	8,211.34	10,000.00
Materials and Supplies	12,756.05	14,000.00
Special Current Charges	1,791.53	1,850.00
Equipment—Capital Outlay	2,647.22	8,000.00
Major Repairs	1,875.63	....
Insurance Recoveries—Damage Claim	150.00	....
Grand Total of Expenditures	$ 74,493.95	$ 86,600.00

OYSTER SEED GROUND ACCOUNT

Means of Financing:

Dedicated Revenue to the establishment of Oyster Seed Grounds and to the planting, propagation, cultivating, policing, preservation and distribution of oysters as set forth in Act 227 of 1944 and Act 533 of 1950

Tax on Shells Taken from State Owned Water Bottoms	$ 134,454.23
	$ 134,454.23
Cash Balance Fiscal Year ending June 30, 1950	$ 61,114.10
Revenue Fiscal Year ending June 30, 1951	134,454.23
	$ 195,568.33
Expenditures Fiscal Year ending June 30, 1951	151,273.59
	$ 44,294.74
Estimated Revenue Fiscal Year ending June 30, 1952	165,000.00
	$ 209,294.74
Estimated Expenditures Fiscal Year ending June 30, 1952	113,700.00
Unencumbered Balance June 30, 1952 estimated	$ 95,594.74

Analysis of Expenditures:

Class of Expenditures:		
Salaries	$ 47,499.34	$ 41,000.00
Contractual Services	38,165.95	35,000.00
Traveling Expenses	6,009.76	5,000.00
Materials and Supplies	20,945.03	20,000.00
Special Current Charges	1,864.95	1,700.00
Equipment—Capital Outlay	4,252.25	11,000.00
Construction	32,536.31	....
Grand Total of Expenditures	$ 151,273.59	$ 113,700.00

FUR AND REFUGE—MARSH ISLAND IMPROVEMENT FUND

	Actual 1950-51	Estimated 1951-52
Means of Financing:		
Funds received from the Russell Sage-Marsh Island Lease for improvements to the Marsh Island Refuge:		
Cash Balance Fiscal Year ending June 30, 1950 ....$	180,457.99	
Insurance Recoveries	11,200.00	
	$ 191,657.99	
Expenditures Fiscal Year ending June 30, 1951	55,008.90	
Unencumbered Balance June 30, 1951 $	136,649.09	
Estimated Expenditures Fiscal Year ending June 30, 1952	106,400.00	
Unencumbered Balance June 30, 1952, estimated ....$	30,249.09	
Analysis of Expenditures:		
Class of Expenditures:		
Salaries ....$	28,820.65	$ 48,000.00
Contractual Services	193.12	2,500.00
Traveling Expenses	5,816.81	6,500.00
Materials and Supplies	8,796.45	8,000.00
Special Current Charges	1,165.56	1,900.00
Equipment—Capital Outlay	3,648.05	35,000.00
Construction	3,097.01	....
Damage Claim	3,471.25	4,500.00
Grand Total of Expenditures......$	55,008.90	$ 106,400.00

DEDICATED FUNDS ACT 22 OF 1946

Means of Financing:	
Proceeds One-Half Resident Hunting License allotted as follows:	
50% for purchase, construction and maintenance of public shooting grounds	
Cash Balance Fiscal Year ending June 30, 1950..........................	$162,177.08
25% for Predator Control	
Cash Balance Fiscal Year ending June 30, 1950	12,498.65
Total Cash Balance Fiscal Year ending June 30, 1950......................	$174,675.73
Expenditures Fiscal Year ending June 30, 1951............................	12,498.65
Unencumbered Balance June 30, 1951..	$162,177.08
Estimated Expenditures Fiscal year ending June 30, 1952..................	....
Unencumbered Balance June 30, 1951...	$162,177.08

Analysis of Expenditures: Class of Expenditures:	**Actual 1950-51**	**Estimated 1951-52**
Salaries	$ 8,202.50	$ none
Contractual Services	622.39	none
Traveling Expenses	2,170.51	none
Materials and Supplies	880.92	none
Special Current Charges	215.40	none
Equipment—Capital Outlay	406.93	
Grand Total of Expenditures	$ 12,498.65	none

HYACINTH CONTROL

Special Appropriation

Act 89 of 1950—$75,000.00	$ 46,561.20	$ 28,438.80

PURCHASE OR CONSTRUCTION OF NEW BOATS

Special Appropriation

Act 97 of 1950—$25,000.00	25,000.00	none

TURKEY CREEK DAM AND FISH PRESERVE

Special Appropriation

Act 151 of 1950—$31,109.00 Board of Liquidation—(2-27-51)	31,109.00	none

LOUTRE PRESERVE DAM

Special Appropriation

Act 185 of 1948—$100,000.00	none	none

SPECIAL FUND—OPERATING ACCOUNT
SHELL ROYALTY—ACT 533 OF 1950, SEC. 458

Actual—1950-1951	**Estimated—1951-1952**		
$52,472.68	$100,000.00	none	none

CIVIL FEES FOR LAW VIOLATIONS

Fees Collected and Transmitted to the Following Parish School Boards During Fiscal Year 1950-1951

Ascension Parish	$ 384.95
Assumption Parish	525.00
Avoyelles Parish	300.00
Beauregard Parish	487.50
Bienville Parish	25.00
Bossier Parish	25.00
Caddo Parish	25.00
Caldwell Parish	100.00
Catahoula Parish	490.00
Claiborne Parish	25.00
Concordia Parish	332.50
DeSoto Parish	37.50
East Baton Rouge Parish	162.50
Evangeline Parish	160.00
Grant Parish	75.00
Iberia Parish	162.50
Iberville Parish	86.75
Jefferson Parish	237.50
Lafayette Parish	75.00
Livingston Parish	62.50
Morehouse Parish	125.00
Natchitoches Parish	286.96
Pointe Coupee Parish	490.50
Rapides Parish	175.00
Red River Parish	37.50
Richland Parish	25.00
St. Bernard Parish	112.50
St. Charles Parish	100.00
St. Helena Parish	75.00
St. James Parish	200.00
St. John The Baptist Parish	662.50
St. Landry Parish	630.00
St. Martin Parish	25.00
St. Tammany Parish	615.50
Sabine Parish	50.00
Tangipahoa Parish	100.00
Vermilion Parish	37.50
Washington Parish	400.00
West Feliciana Parish	125.00
Winn Parish	25.00
	$8,077.16

DIVISION OF EDUCATION AND PUBLICITY

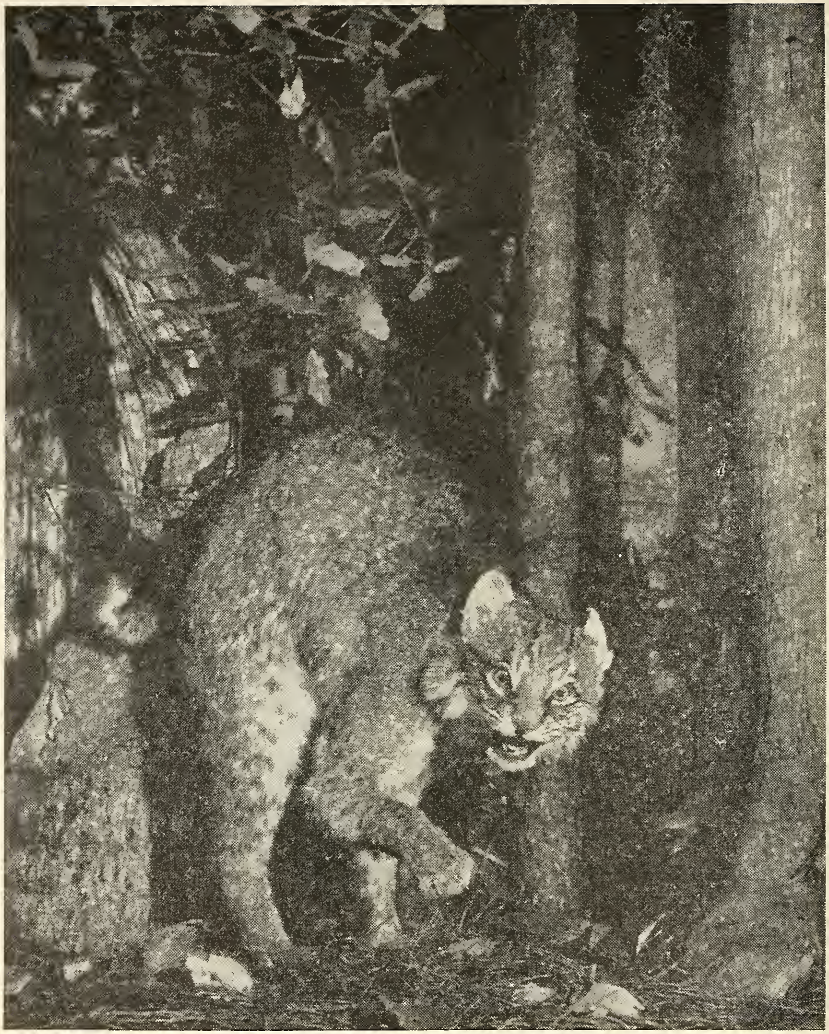
MEL WASHBURN, *Director*

Mel Washburn

TO THIS division is delegated many and varied activities, principally however, is this division supposed to concern itself with the promotion of conservation of Louisiana's natural resources insofar as wildlife and fisheries are concerned.

It is our responsibility to educate the people of Louisiana to the importance of Louisiana's fish and game. We have endeavored to do this through many sources. No one method of promoting the true spirit of conservation could possibly be entirely successful, thus it is necessary to use every known method for the dissemination and distribution of all types of information for education and publicity.

In order to do this we must have a working knowledge of the activities and ambitions of every division within this department. The Division of Education and Publicity is, above all, the clearing house for all types of information sought by the peoples of this state and by out-of-state individuals, organizations, bureaus and institutions. By answering the many queries that come to the attention of this division every day, we are able to acquaint both Louisianians and out-of-state information seekers of the wildlife natural resources that Louisiana pos-



A fine specimen of Louisiana bobcat, mounted and set in simulated natural habitat by experts at the state's wild life museum.

sesses and at the same time we are able to impress on these the necessity for true conservation.

It is becoming more and more evident to everyone in Louisiana that a more favorable public sentiment is being created throughout the state with respect to our own wildlife and fisheries resources. This general absorption of education con-

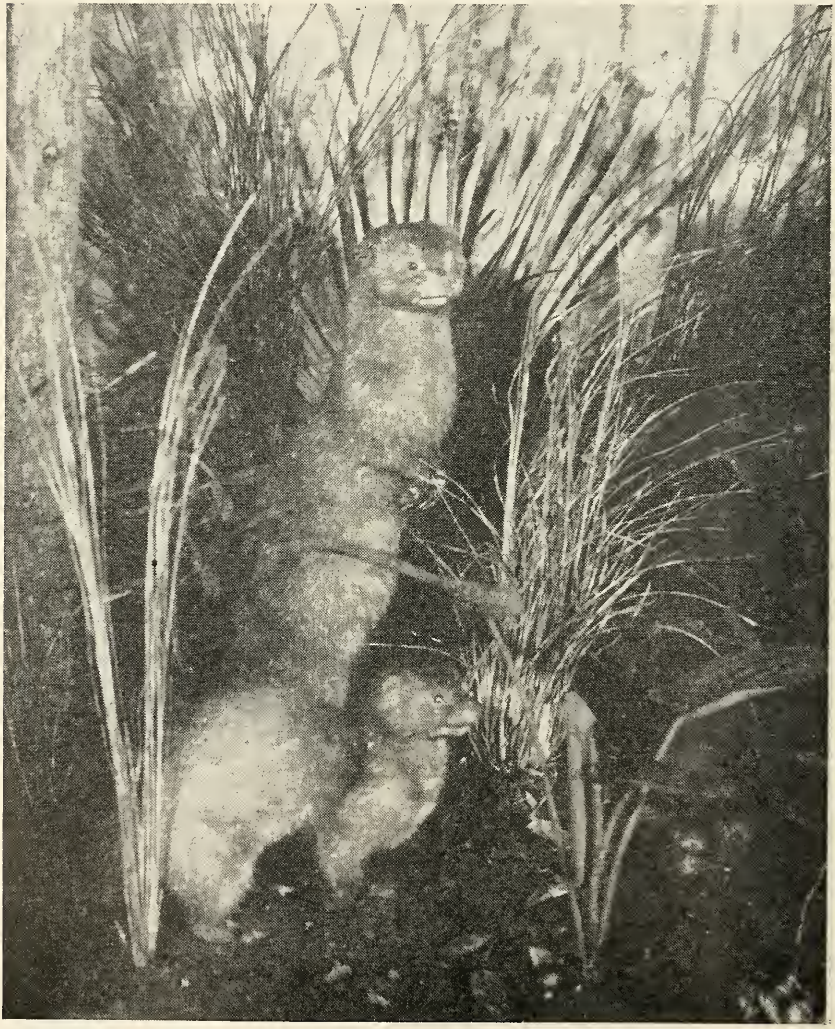
Part of a wildlife exhibit arranged by the Department of Wild Life and Fisheries for a garden club meeting.

cerning conservation can generally be attributed to the public relations contacts that this office develops.

Foremost in our efforts to promote conservation of Louisiana's wildlife resources has been the development of the magazine, *The Louisiana Conservationist,* published by this Department in the interest of true conservation, good sportsmanship, and the education of the younger generations to the necessity for protecting Louisiana's fish and game. This magazine, which started in September, 1948, with a modest mailing list of 6,200 has grown to a mailing list of more than 42,500, and is steadily increasing each month.

At the outset we were glad to agree to put every member of a wildlife or sportsman's club in the state on our mailing list. This practice we have continued and will continue. This does not mean, however, that any man or woman in Louisiana interested in this Department's conservation efforts is not entitled to receive this magazine unless they join a sportsman's club. As the purpose of this publication is the dissemination of education for better conservation, it is highly desirable that every bona-fide resident of this state become better acquainted with Louisiana needs for the protection of its natural resources, and the latest methods of restocking and preservation of our fish and game assets.

We have tried, at all times, to keep this publication interesting to all the types of people of Louisiana and at the same time keep it entirely free of all political discussion or dissention. At the same time we have tried determinedly to keep sectional dis-



An exhibit of Louisiana mink in the Wild Life and Fisheries Museum.

sention among the various sportsman's clubs out of this magazine. It was originated for the sole purpose of promoting conservation and we have endeavored to hew strictly to the line in that respect. Since its inception it has grown in prestige among the wildlife magazines published by other states, until now it ranks close to the top despite its short life.

In addition to publishing the magazine it has been our obligation to publish a biennial report every two years that can be and is used as the "bible" of the Department of Wild Life and Fisheries. This biennial report (in book form) is distributed to every school in Louisiana, to all wildlife groups, to each member of the state legislature, to all state officials, and to all others interested in one phase or another of Louisiana's wildlife and fisheries.

It contains a wealth of biological data, a complete resume of fish and game restocking, the development of game refuges, a concise and complete report of all fisheries activities and their

One of the excellent exhibits arranged by artist Eleanor Fairman and taxidermist Edouard Morgan for the museum maintained by the Department of Wild Life and Fisheries. This one shows a mother and baby skunk.

The Louisiana otter, as shown in our wildlife museum.

evaluation, the administration of the fur and refuge division, enforcement division, oyster and water bottoms division, division of research and statistics and financial administration of this Department.

By means of this biennial report it is possible to answer almost any question that is propounded by seekers of information about our wildlife resources.

In addition to the publication of *The Louisiana Conservationist* and the FOURTH BIENNIAL REPORT, this Department has been active daily in the dissemination of news of the activities of this Department, throughout the state, and no publicity release has been other than a straightforward statement of fact.

We have been fortunate in being able to assist numerous national magazines in obtaining story material and pictures publicizing Louisiana's hunting, fishing, commercial fisheries, fur industry, oyster industry and mineral development. We have also promoted and assisted in the making of motion pictures exploiting Louisiana's fisheries, especially the shrimp and oyster industry, that should be of great value to the future of these activities.

We have also been able to exploit Louisiana's fish and game potentialities on television programs throughout the United States by providing movies from our movie library for this purpose. In connection with our movie library we have been able to provide motion pictures for hundreds of meetings throughout the state of civic organizations, wildlife groups, sportsman's clubs and schools as a further method of enhancing our conservation program.

Louisiana's Department of Wild Life and Fisheries is one of the few state departments in America that maintains a museum of natural resources. This museum, located in the Presbytere building in New Orleans, across from the famous Jackson Square, is in a state owned building, consequently its operating cost may be held to a minimum.

A family group of muskrats, another exhibit at the state's wildlife museum.

Another exhibit in the wildlife museum showing a beaver in natural habitat simulation.

There are approximately 3,000 individual exhibits of wildlife and fish arranged for attractive display in the various rooms of the museum, and they are constantly being added to by a technical staff who develop and arrange backgrounds to simulate the natural habitat of the specimens on display. Our state museum is considered one of the foremost of its kind in America and one of the most complete.

In this museum is a movie theatre with a seating capacity of more than 300 where motion pictures are shown free, almost daily, to school classes, civic groups and organizations, and other groups either transient or belonging to the city and state. It is estimated that more than 12,000 persons visit this museum each month of the year.

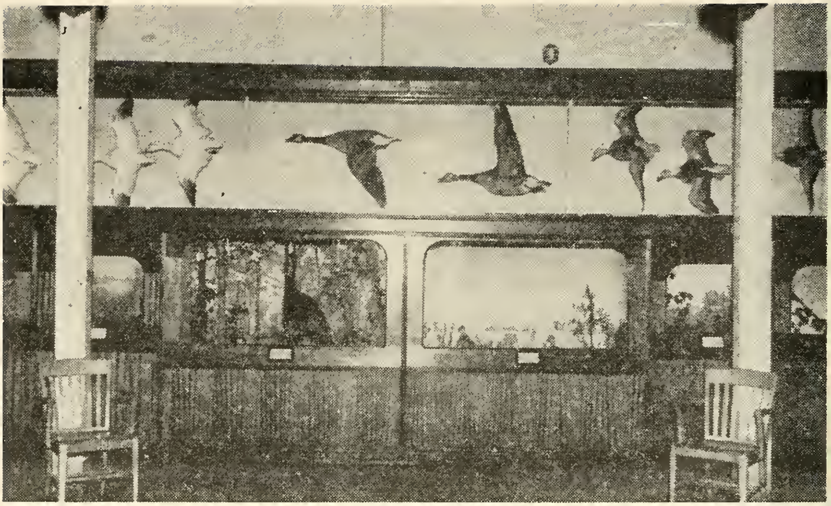
Another most important part of our educational program is the building and maintenance of wildlife exhibits that may be shown throughout the state. These have become in great demand by convention groups, clubs and kindred assemblies, as well as to all of the state's fairs and festivals. These portable exhibits assist in bringing the conservation message directly to the people in various sections of the state as each individual exhibit is arranged with regard to conditions that prevail where it is to be shown.

During the past biennium we have sent specially designed photo exhibits to various cities in the United States and as far as Mexico City, where a Louisiana wildlife exhibit was a feature of the International Hotel Men's Association convention in 1951.

As our museum of natural history is open seven days a week it has become one of the greatest tourist attractions in New Orleans' famous French Quarter.

There is a vital need now in this division for new and up to date printed material on each phase of our wildlife conservation activities. At the present time we are able to distribute only material that has been in print for a number of years and much of it is greatly out of date. Due to the fact that nothing new has

Eleanor Fairman, artist at the Louisiana Wild Life Museum, preparing backgrounds for exhibits.



Wild waterfowl exhibit in Wild Life Museum.

been printed for several years, much of the material that could be distributed formerly, is now exhausted and should be replaced with new pamphlets and booklets that are in constant demand.

One example of this antiquated material is the fish map (of which there are now none left) that is in daily demand. This map was printed considerably more than a decade ago, and bears the name of the late William G. Rankin, who was at that time Commissioner of Conservation. It is urgent that a new map be secured and printed. As there is a fee covering the cost of each of these maps, paid by the recipient, these maps, that are so popular and in constant demand, eventually will cost nothing, hence it would seem advisable that new and up to date maps be secured as soon as possible. It would also seem advisable that a publication dealing with predators be compiled and printed inasmuch as the Department's predator control unit has been doing such splendid work throughout the state. There is undoubtedly a vital need for educational matter dealing with predatory animals that prey on our state's fish and game.

At the present time there are two publications "in work" to be paid for by funds already dedicated for their publication. One of these books is a complete revision of the former book dealing with fishes and marine life; the other is a book dedicated to the Louisiana fur industry; it is hoped to have both of these publications off the press during the early summer.

One of this division's publications that has become exhausted and was extremely popular was entitled "Birdlife of Louisiana." As the replenishment of the supply of these books would only entail the reprinting of the specified number and would not need to be compiled and edited, it would seem advisable that a new supply of this publication be obtained.

During the past biennium many thousands of stories have originated in this division pertaining to conservation education, offiicial proclamations, and orders of the Commissioner relative to conservation of our natural resources. These stories are distributed to all daily and weekly publications throughout the state, to the various press associations, and to the radio stations. Our relation with the press and radio has been extremely cordial, and we have found much cooperation from these news distribut-

Simulated woodland scene at Wild Life Museum with woodcock in foreground.

Wild turkey in natural habitat as exhibited at Wild Life Museum. All these specimens have been mounted by Edouard Morgan, state taxidermist.

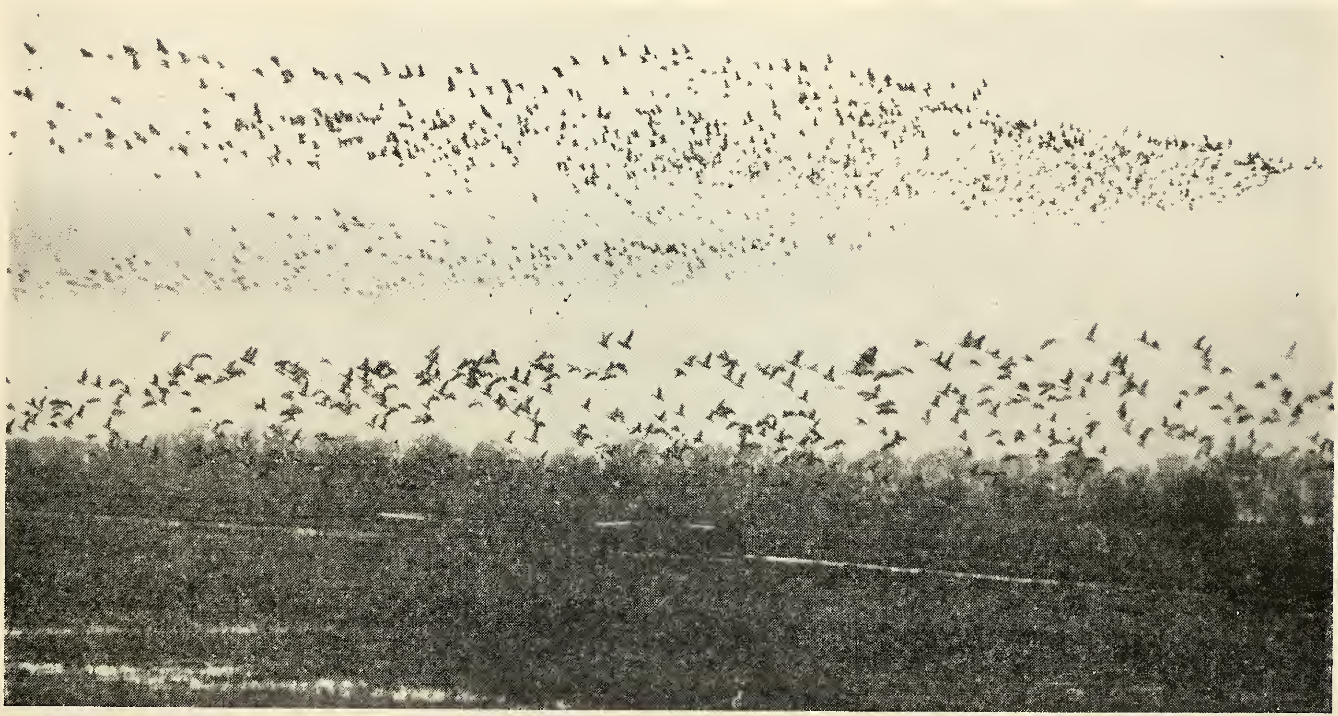
ing agencies with regard to the use of story material and pictorial art.

During the last two years I have spent considerable time making personal contacts throughout the state, addressing meetings of wildlife organizations, civic groups, school groups, conventions, etc., preaching the gospel of fish and game conservation, and stressing the overall need for observance of Louisiana's fish and game laws. These contacts and personal appearances are proving more valuable with each succeeding day and it is encouraging to learn that there is a steadily developing increase, throughout the entire state, of sentiment against game law violators and for the sincere conservation of all of our natural wildlife resources.

We have endeavored to use every possible source for the distribution of conservation education. We have been fortunate in being able to interest numerous nationally distributed and popular publications in Louisiana wildlife with the result that many of these, such as "Sports Afield," "Field and Stream," "The Outdoorsman," and similar publications have carried stories on Louisiana's fish and game, this department's restocking program, and other phases of our conservation efforts.

We have assisted major moving picture companies in photographing our wildlife with the result that much of our pictorial and wildlife beauty has been included in nationally distributed films. We have also assisted many of the famous outdoor writers of America in obtaining Louisiana data and pictures for their articles, and we have cooperated to the full extent of our ability in the promotion of feature stories and editorial articles looking to better conservation education. In short, we have endeavored to leave no stone unturned in impressing on the mind of every man, woman and child in this state the now critical need for sincere conservation in all its phases pertaining to wildlife restoration and protection.

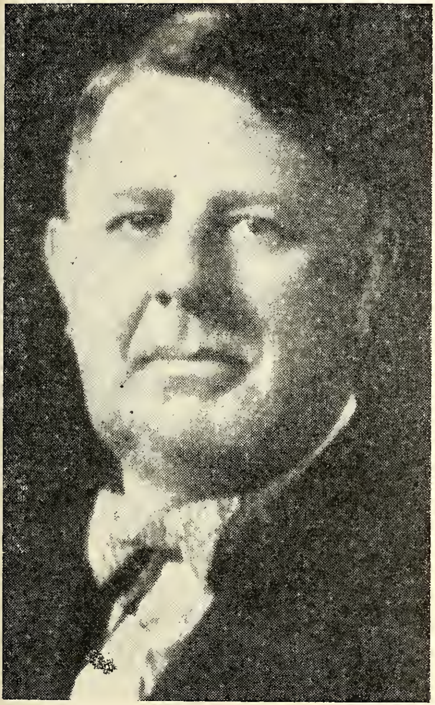
A Louisiana opossum



A flight of blue geese descending on a rice field in Vermilion Parish, near Abbeville.

FUR AND REFUGE DIVISION

ARMAND P. DASPIT, *Director*



Armand P. Daspit

I SUBMIT herewith the Biennial Report of the Fur and Refuge Division for the seasons 1949-1950 and 1950-1951.

The provisions of statutory and constitutional law give the Department of Wild Life and Fisheries authority to protect and preserve the wild life, fur animals and alligators of the state as well as all the other natural resources.

One of the most valuable of the natural resources of our state is the fur animal industry. Louisiana produces more muskrats, more nutria, more otter, more mink and more alligator skins than any other state in the union.

The last two years' catch of fur animals in Louisiana, as well as in other states, was considerably lower than in previous years and has caused some concern to the fur trade. The scarcity, however, has brought higher prices.

After a study made by officials of the Fur and Refuge Division it was found that most of the trouble was caused by drought and intestinal parasites which afflicted the "rats" the past two years.

Of the 12,000 trappers who ordinarily head out into the marshes every trapping season in Louisiana, only a fraction were active in the past two years, and a comparative few made expenses.

Typical trapper's camp with a number of trappers waiting for the fur pickup boat of the Fur and Refuge Division of the Department of Wild Life and Fisheries.

Normally, about 40,000 residents of the state made all or some of their livelihood from furs, among which are dealers, buyers and trappers. The buyers go throughout the state and into the bayous in motor boats, buying up furs from the trappers for resale to the dealers. It is about the only business where the buyers buy at retail, a few hundred furs at a time, and then sell their assembled lots at wholesale.

Although there is no danger of Louisiana losing her rank as the leading fur producing state in the nation, many people in the trade are pessimistic about the future.

THE PRESENT MUSKRAT SITUATION IN SAINT BERNARD PARISH, LOUISIANA

Due to the continued decline in the muskrat population, the Police Jury of Saint Bernard Parish requested Commissioner Ernest S. Clements to send representatives of this office to meet with them in order to discuss the general fur situation in their parish. As a result, Mr. Armand P. Daspit, director of the Fur and Refuge Division, Louisiana Department of Wild Life and Fisheries, and the late Dr. Herbert L. Dozier, Wildlife Research Biologist of the United States Fish and Wildlife Service, met with members of the Police Jury, together with a large representative group of trappers and marsh owners at the Chalmette Court House, April 5, 1951, in order to discuss the present serious muskrat situation.

Starting with the 1947-1948 trapping season the annual muskrat catch has dropped to a present very low level. The purpose of this meeting was to discuss the factors which brought about this radical reduction and to discuss any possible suggestions or proposals for remedying this serious situation.

REASONS FOR THE DECLINE

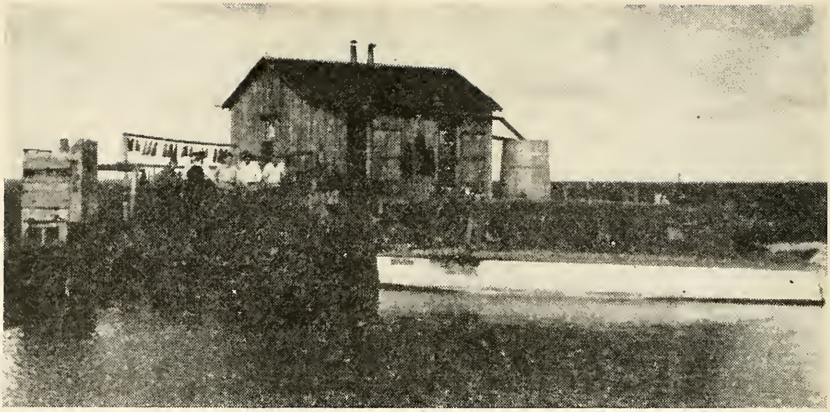
The following major reasons have suggested themselves for the radical reduction:

A. *Weather effects.*

1. Hurricanes and Floods. In September of 1948 a large hurricane hit this coastal area and produced an extremely heavy mortality and dispersal of muskrats and other forms of wildlife. This hurricane resulted in a heavy salt water intrusion over much of the lower section of the parish and in large areas of standing stagnated water that remained over a period of several weeks, causing great damage and loss of muskrats.

It has been the experience over many years that muskrats inhabit the slightly brackish marsh areas of the state

A typical trapper's camp on Marsh Island.



A trapper's camp on a state game preserve showing furs on stretchers and drying frames.

and prefer the three-cornered grasses as their principal food. Extensive salt water intrusion brings about a condition that gradually eliminates this favorite food plant and results in a heavy mortality of muskrats.

2. Salinity. Although muskrats may reproduce themselves under rather heavy saline conditions, survival of the young is seriously affected.

3. Drought. For the past three years there has been prolonged droughts that have caused the marshes to completely dry and harden to such an extent that it became difficult at times for the muskrats to secure their food and survive.

B. *Diseases.*

1. Extremely low water and prolonged drought brings about a favorable condition for the development of the young of internal parasites, such as liver flukes, tapeworms, intestinal worms and coccidiosis.

2. In Maryland, and at several other widely separated locations over the country, major outbreaks of disease in muskrats have been traced to an infection by the so-called paratyphoid organism, *Bacillus typhimurium.* The organism which seems to have caused the greatest losses, however, is known as Errington's Disease and as far as we can now determine is caused by an unknown virus. This

disease manifests itself in a hemorrhagic condition with blood clots in the thoracic cavity or in the intestines. Recently, Dr. Dozier found these same identical symptoms in several dead muskrats from the Southwest Louisiana area and he considered this to be the identical disease that has brought about radical muskrat declines and wipe-outs along the Eastern Seaboard. The hemorrhaged condition in the thoracic cavity is so typical of this disease that in several cases it has been called "Hemorrhagic Septicemia."

3. "Lousy" 'Rats. At times, muskrats suffer from heavy infestations of mites or "lice" which may build up in such enormous numbers that during these periods many adults and untold thousands of baby muskrats die.

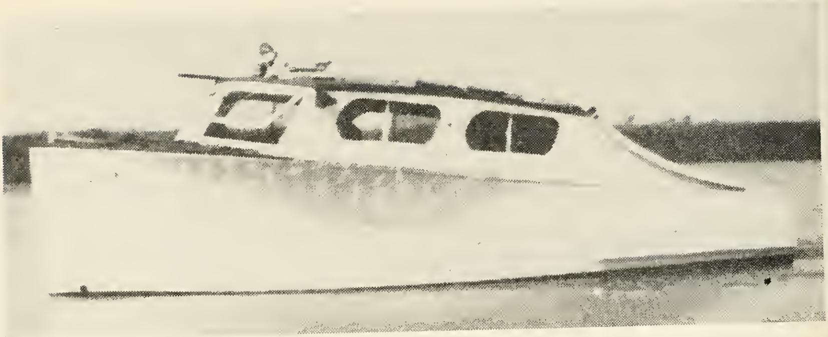
C. *Predation or Natural Enemies.*

Muskrats at times suffer from many natural enemies such as mink, marsh raccoons, water moccasins, gars, alligators, hawks and owls. There is an annual drain exerted by this group of predators as a whole on the muskrat that at times may become extremely serious. Over the last few years we have seen a terrific increase in the marsh raccoon population. The marsh raccoon is considered by trappers to be probably the most serious predator in this group on our muskrats. This fact was recognized this past season by the Louisiana Department of Wild Life and Fisheries by their action in "outlawing" the raccoon in the coastal parishes.

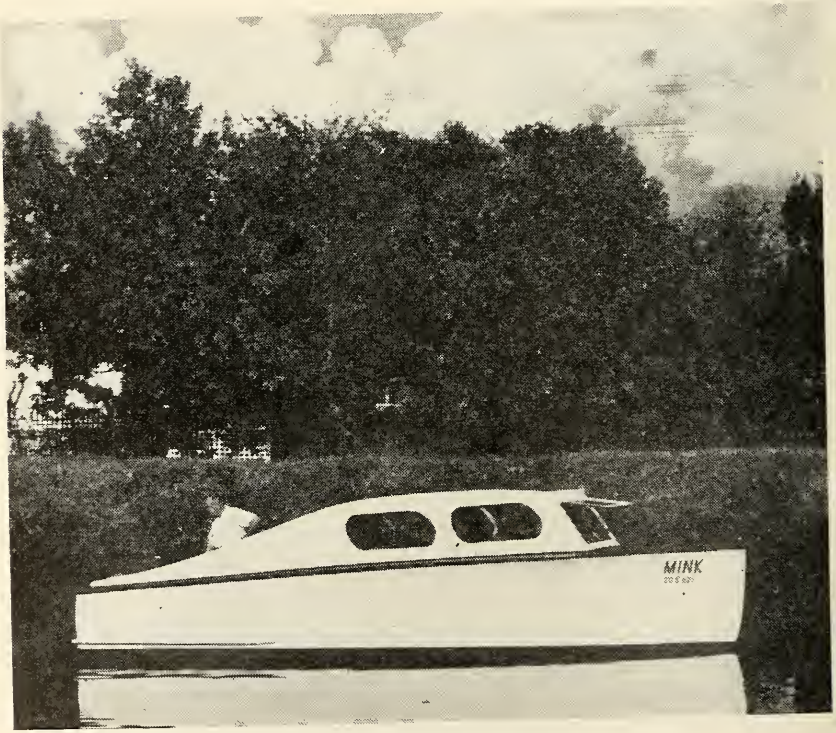
RECOMMENDATIONS

1. Maintain slightly brackish water in so far as possible.

Saint Bernard is admirably suited for this purpose for the reason that the entire parish lies along the banks of the Mississippi River with six large canals leading to the river. These could be easily used to transfer water from the river during suitable high water periods at which time pollution is not a factor. For this purpose large syphons have been suggested by the local Police Jury and this method appears feasible. Caution must be taken to determine the condition and quality of the water during the various periods and admit water only at necessary and suitable intervals.



Patrol boat "Beaver"

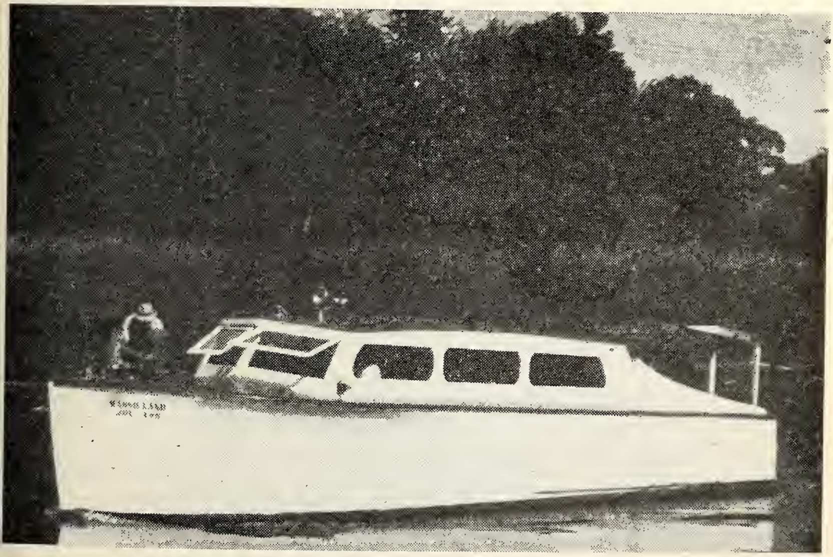


The patrol boat "Mink"

2. Over past years inefficient management of marshes, by improper distribution of trappers, has caused in many cases undertrapping with consequent serious "eatouts." It is our opinion that whenever mustkrat concentrations build up to two houses or more per acre every effort must be immediately made to reduce the surplus population. If action is neglected at this time "eatouts" are soon unpreventable in spite of most intensive trapping effort.

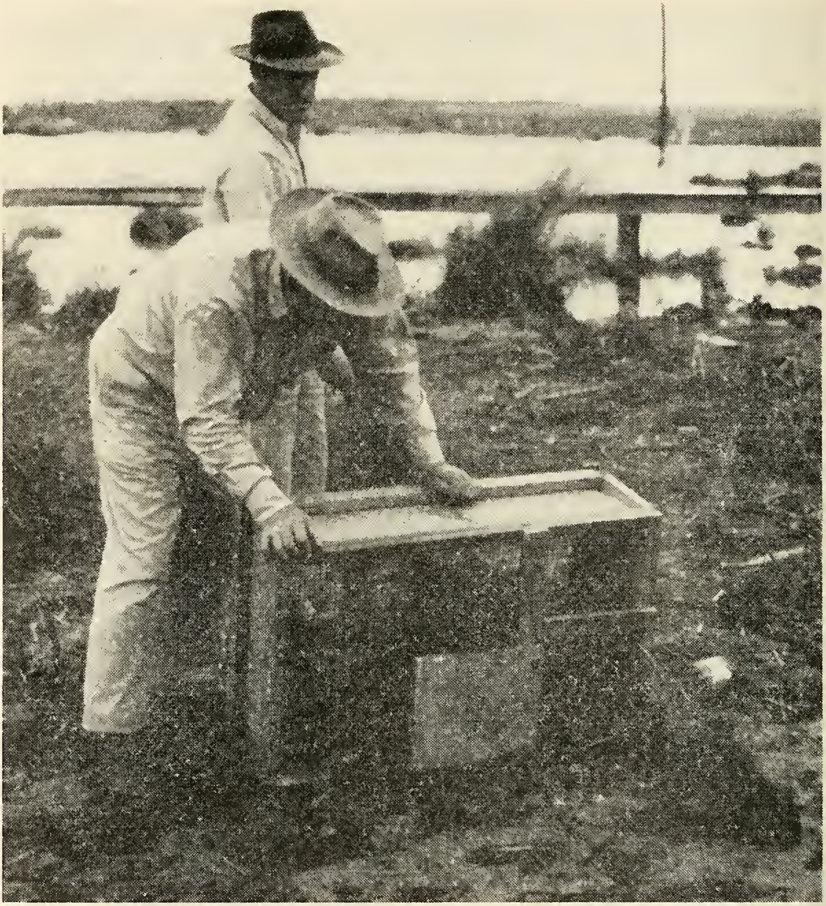
3. Remedying "eatouts." The easiest way to remedy the "eatouts" is by draining the area with a small mudboat, making a channel of about thirty inches wide and thirty inches deep so that the water may be removed from such "eatouts" and permit sunlight to strike the bottom in order to bring about germination of the dormant seed lying in the mud. These ditches should be arranged so as not to permit or allow salt water intrusion. The so-called closed or "blind" ditches are the most desirable for this purpose.

4. *Trapping Procedure.* While over-trapping can occur under certain conditions it has been the experience of many marsh owners and old experienced trappers in Louisiana that in cases of normal muskrat populations it be-



The patrol boat "Marshland"

LOUISIANA STATE UNIVERSITY LIBRARY



Live nutria, taken from Marsh Island, being liberated near Lacombe, in St. Tammany Parish.

comes almost impossible to over-trap. Over-trapping is by far preferable to under-trapping as "eatouts" must be prevented, by all means.

5. *Control of Predators.* Efficient control of predators will lead to greater muskrat crops. In recent years the terrific increase in the marsh raccoon population has become one of the most serious factors in bringing about the radical reduction and also an enormous increase in damaged pelts. Every effort must be made to reduce the marsh raccoon population.

6. *Marsh Burning.* Judicious use of marsh burning is an extremely important factor in muskrat production. Due precaution should be taken to burn only when the water level in the marsh is such that deep root burns will not result. At least three inches of water should be present over most of the area and then potholes will not result.

7. Last but not least and probably the most serious of all is the lack of regard for the conservation laws. Preseason and post-season "outlaw" trapping must be controlled.

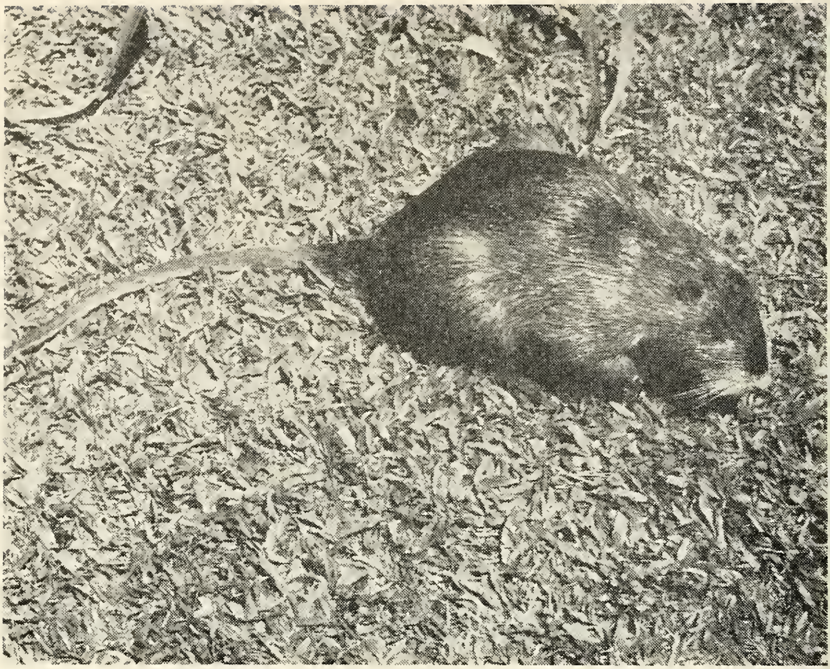
The condition that exists in Saint Bernard Parish exists in practically all the coastal parishes where fur animals are produced.

NUTRIA

The nutria (Myocastor coypus) also known as South American beaver, and coypu, is well established in Louisiana.

Some twenty years ago, through the efforts of this Department and the writer, six pairs of nutria were bought by Mr. E. A. McIlhenny of Avery Island, Louisiana. These nutria were penned and propagated over an area of about twenty acres. Several years after the project was started a violent storm raged along the Gulf Coast and the pens were destroyed and the animals naturally were released. They are now invading our marshes and swamplands and are propagating very rapidly. They are found in the parishes of Iberia, Vermilion, Cameron, St. Mary and Plaquemines. These animals have migrated to Port Arthur, Texas, on the west and on the east to the Mississippi River. They are also invading the Atchafalaya Spillway consisting of about one million acres, which will in the future, prove the ideal territory for their propagation. If the nutria continue to propagate and increase as they have done since their introduction in Louisiana, it is believed they will eventually surpass the muskrat as a fur producer in our state.

Louisiana has about three million acres of marsh land lying along the Gulf of Mexico between the State of Mississippi and the State of Texas, and just north of the marsh area is a cypress and tupelo swamp of about two million acres that rims the marsh land the entire distance. Both of these areas contain desirable nutria food and the animals are allowed to roam wild. They expand and roam of their own accord much as muskrats do.



Louisiana's new fur fortune potential, the nutria.

The Fur and Refuge Division, after studying different locations in the state where it was thought nutria would thrive, started a project of transplanting these animals to the various locations. They were placed in the parishes of Lafayette, Saint Charles, Saint Bernard, Saint Tammany, Plaquemines, Assumption, Lafourche and West Feliciana. They will be given all the protection possible so that they might propagate and eventually invade the adjoining parishes.

Our usual trapping season in Louisiana is seventy-five days but the previous Legislature cut down the trapping season on nutria to forty-five days in order that they might be allowed to spread and multiply. It is believed that in ten years, with rigid law enforcement the state will produce ten million nutria. They are strong, hardy animals and are able to withstand the rigors of storms, cyclones, etc., much better than the muskrat.

Dr. Frank G. Ashbrook and the late Dr. Herbert L. Dozier of the Fish and Wildlife Service, United States Department of the Interior, have prepared a bulletin entitled "Practical Way to Dry

Nutria Pelts." This is a very good publication and gives the trapper the proper instructions on how to prepare and stretch his nutria pelts. Reprints were made of this bulletin by the Fur and Refuge Division of this Department and sent to every trapper that we could reach.

A PRACTICAL DRYING FRAME FOR NUTRIA PELTS

The nutria (Myocastor coypus) also known as South American beaver, swamp beaver, and coypu, is now well established in Vermilion, Cameron, New Iberia, St. Mary, and Plaquemine Parishes. The migration continues and the nutria caravan has nearly reached Port Arthur, Texas, on the west, and on the east to the Mississippi River. The annual take of nutrias is now nearly 40,000. During the period 1949-1950 trappers took a total of 122,039 skins which sold for $393,700. The rapid rate at which nutria are increasing and spreading over the Gulf Coast marsh areas has greatly impressed officials of the Louisiana Department of Wild Life and Fisheries, so much so that some of them believe the nutria eventually may surpass the muskrat as a fur producer in this state.

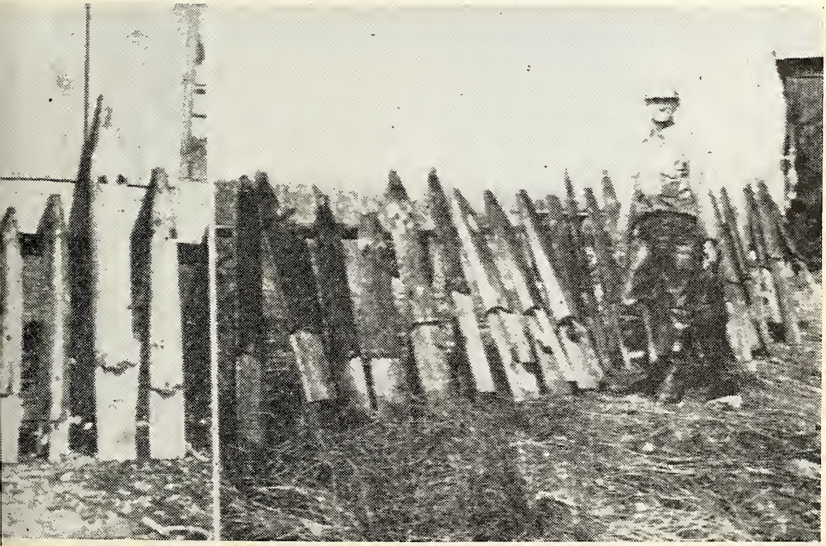


FIGURE 1—Left. Primitive, narrow, wooden stretchers in general use for nutria, in early years. Right. A slightly improved wooden board stretcher widely used prior to introduction of steel types.

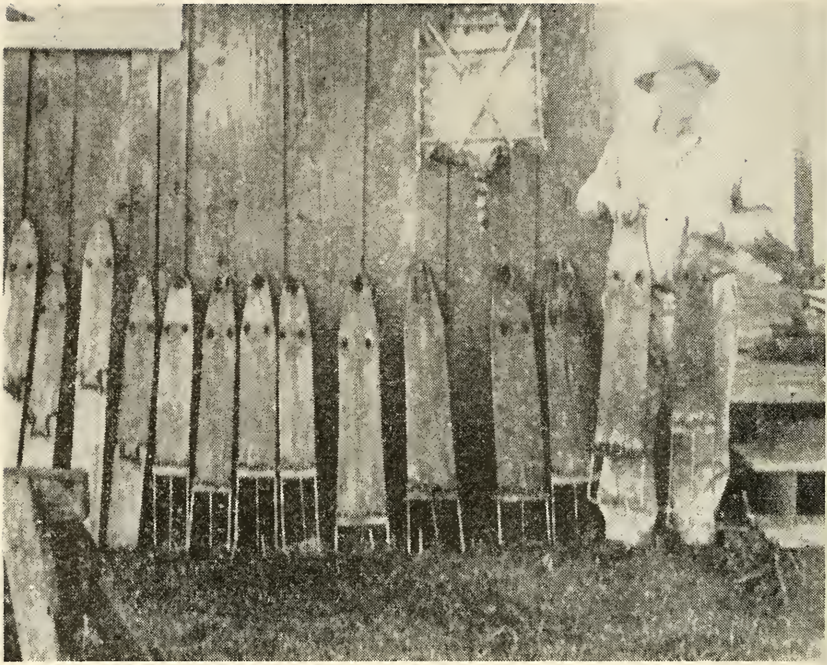


FIGURE 2—Lionel LeBlanc demonstrating the adjustable type of steel stretcher that he devised for handling nutria skins.

Since the first open season (1943-44) on nutria in Louisiana, the trappers have come a long way in preparing the pelts for the raw fur market, but more improvement is necessary before maximum returns can be realized. The stretching frames, many of them still made of wood, now conform better to fur trade requirements and skins are being more thoroughly fleshed. In the 1946-47 season a veteran nutria trapper, Lionel LeBlanc, designed an adjustable spring frame on which the skins are shaped and stretched. The bottom or rear end of the pelt is tacked to a sliding wooden block. A cord is stapled to the block so that when the pelt is fastened, the block can be pulled and tied fast to the base of the frame. This exerts sufficient tension to stretch the skin properly. This metal frame is a great improvement over the wooden types and has been used by a considerable number of trappers. However, the metal material in the frame was not satisfactory for it rusted very quickly. This caused the pelts to stick to the frame so tightly that it was difficult to remove them without causing damage to the pelt.

A further study of nutria developments in Louisiana revealed that the pelts offered for sale by the trappers did not come up to the fur trade's exact standard and there was an exceedingly large number of small pelts, under 21 inches, in the offerings. As a result the prices received by the trappers for these furs were also below standard. The greatest single factor that was handicapping the trappers in preparing pelts of uniform shape and size was the lack of a practical device for properly drying and stretching the skins. This situation was presented to the officials of the Animal Trap Company of America; Armand P. Daspit, Director of Fur and Refuge of the Louisiana Department of Wild Life and Fisheries; managers of national wildlife refuges and private marsh areas, fur tradesmen, and trappers. All were intensely interested in cooperating to develop a device to aid the trappers in handling nutria pelts in such a manner as to insure the highest possible returns. The various interests concerned realized that this was sound reasoning when the time and effort spent in trapping the animals is considered.

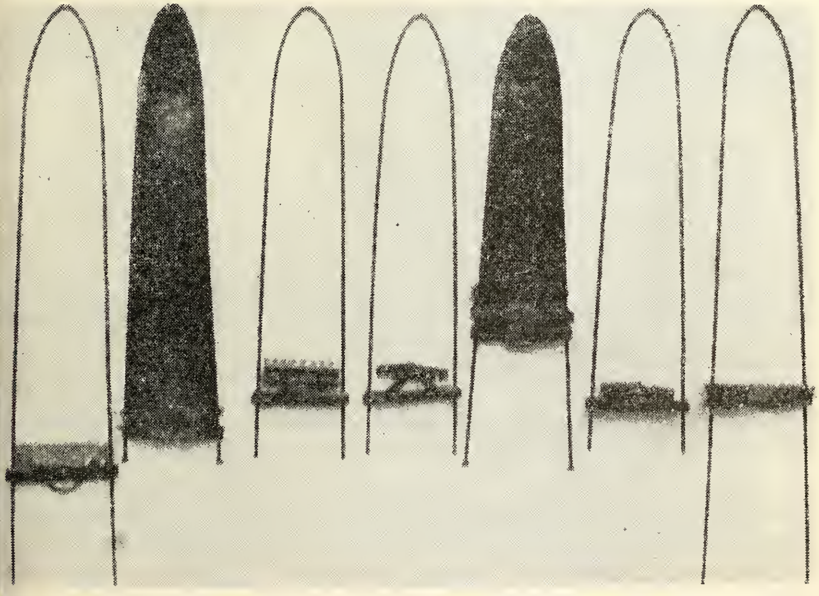


FIGURE 3—Types of experimental nutria fur stretchers designed by the Animal Trap Company of America and tested for performance. Left to right: (1) two-bar lock with wooden block; (2) 1-piece lock with wooden block; (3) two-bar lock, hook teeth cut in one bar; (4) two-bar lock, hook teeth cut in both bars; (5) two-bar lock, with 14 fish hooks, all metal; (6) two-bar lock, hook teeth cut in both bars; and (7) 1-piece lock, pin-up, all metal.

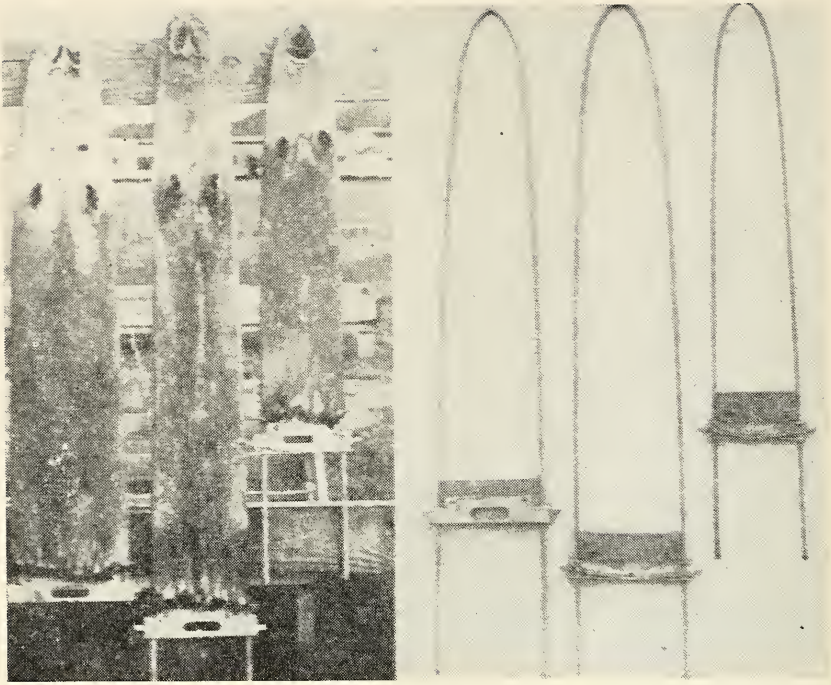


FIGURE 4—Left. Earlier experimental models, left to right: (1) 36″x8″, too wide and short; (2) 44″x6½″, too narrow for larger skins, permitting "puckering" along median area; and (3) 36″x5½″, fine for small and medium size skins. Right. Latest and most satisfactory type, 44″x7″ and 36″x5½″.

Biologists in the Fish and Wildlife Service gave specifications and suggestions to the Animal Trap Company and after a number of conferences it was decided to construct some experimental drying frames of steel rather than wood.

To obtain pelts and expedite this experiment, permission was granted by Mr. Daspit to take nutrias out of season, and a trapper was hired in October 1949, to do the work. A total of thirteen nutrias of various sizes were trapped and these pelts were used in testing the various models of drying frames. The skins were fleshed, quick frozen, and air-expressed to the Animal Trap Company in Lititz, Pennsylvania, for further study and testing on various experimental frames.

The most promising model, featured a gadget to which the base or rear end of the pelt could be fastened and then pulled and automatically held tightly in position until the skin was thoroughly shaped and dried. It slides forward any desired distance by simply exerting thumb pressure to each end of a steel spring. When tension or pull is released the device automatically locks itself and the skin remains taut. This contrivance includes an inserted wooden block of the non-splitting type, which is held in place by screws. It has several small holes through it which permit circulation of air to hasten the drying of the skin.

This model drying frame was demonstrated in the field to numerous groups of trappers and fur buyers who resided in Louisiana. They thought it was a great improvement over all other types of nutria drying frames with which they were familiar. All were enthusiastic over the block device which slides, stretches, and selflocks the pelt in proper shape for drying. In the opinion of the trappers and fur buyers, this model was indeed a satisfactory and practical drying frame for nutria pelts. It was therefore decided to make 100 of these frames to be used in a comprehensive field test in the marshes of Louisiana during the 1949-50 trapping season. When the biologist of the Fish and Wildlife Service received the 100 frames in Lafayette, Louisiana, he delivered them to eight rather widely separated marsh areas where nutria trappers were operating. The cooperating managers and trappers in these areas gave the drying frames a thorough test but they were all unanimous in reporting that this particular model was not satisfactory for all sizes of pelts. It was too short for extra large pelts and too wide to accommodate small narrow ones.

It became obvious from this experiment that two different sizes of frames were necessary to handle large and small pelts properly. After making further checks and observations with shaping and stretching raw pelts on model frames of various lengths and widths, it was decided to construct the most desirable model in two different dimensions, one 36 and the other 44 inches in length with sliding gadgets 5½ and 6½ inches wide respectively. A number of these frames was constructed and tried out in the field during February, 1950. The final report of the cooperators was that this model was highly satisfactory and the small frame was "just right" but that some of the larger skins when stretched on the 44-inch frame puckered along the median length. These objections were corrected by reshaping the steel frame and by widening the base of this model to 7 inches.

This drying frame, in two sizes, for nutria pelts, is the most practical and satisfactory model yet developed. It is made of heavy, galvanized steel wire, sturdily constructed, and of the standard shape and size. It is extremely durable and the block of wood in the sliding device is easily replaceable. The task of properly shaping and drying nutria pelts is made much easier and one person can easily handle a large number of pelts. The skins dry quicker and more thoroughly on this metal frame than on the wooden models. Furthermore, they can be suspended and handled easier during the drying process and the dried pelts can be removed more simply and without damage. Fur buyers who examined this drying frame were quite enthusiastic about it.

Plans are being made to have commercial quantities of nutria drying frames available in two sizes for the 1950-1951 trapping season. This aid should stimulate and encourage Louisiana trappers to give proper attention to preparing and handling nutria pelts for the raw fur market. It should also aid the trappers in Texas, Washington, and other states where nutrias are being trapped and the furs sold in commercial quantities.

The fur trade is interested chiefly in the underfur of the nutria for it determines the value of the pelt. The underfur should be dark with a bluish gray cast. Density is also important and silkiness and lustre are most desirable. Thinly furred, pale, rusty looking fur has no real value and is not wanted. The condition of the skin or leather side of the pelt is another important factor to be considered in determining quality. The skin of a prime nutria pelt has a dark, bluish color. A light, papery skin is unprime. The fur trade recognizes three qualities of nutria pelts, first, second, and third, besides distinguishing between the sizes. Nutria pelts are the only ones that are slit open along the back during the processing. The reason is that the fur on the belly and sides is denser and of better quality than on the back.

The nutria is a rather stockily built animal and just as wide at the shoulders as at the rump. Its skin, therefore, when properly stretched, takes on a rather narrow, elongated and rectangular shape. Everything else being equal, the fur trade purchases nutria pelts on the basis of length in 3 classes, 20 to 23 inches, inclusive; 23 to 26 inches, inclusive; and 26 inches and over. Pelts under 20 inches are not desired. The measurement is taken from along the median length of the belly, from the eyeholes to the "squared-off" base. Raw fur buyers in Louisiana measure the length from the lower lip to the base, but this is not the regular procedure.

The pelts must be handled properly for that is the way the fur trade wants them. Two nutria pelts may be exactly alike in quality and size yet the one handled the right way may bring the trapper two or three times as much as one handled the wrong way.

Always remember that proper pelt handling pays, so take the necessary time and care in handling your pelts. The pelt of the nutria is taken "cased" and dried fur side in, similar to the otter and muskrat. A slit is made along the hind legs to the anus as in the muskrat and the skins are removed in the same manner. Careful cutting of the connective tissue around the tail and rump and parts of the head is necessary to peel the skin loose. Be sure to cut it clear of the navel before pulling off the pelt. Cut the feet and tail.

After the pelt is removed from the carcass, wash it in lukewarm, mildly soapy water to remove all blood, fat, and dirt from the fur. This will also help clean the skin side of the pelt. Remove the pelt from the water, shake out as much of it as possible and hang the pelt up to dry. While the fur is drying take a metal comb and comb the fur and then brush it. This cleans the fur, prevents spoilage, and retains the beauty and durability of the pelt. Next, flesh the skin side thoroughly by removing surplus flesh, fat, and heavy grease. This is done by placing the pelt on a fleshing board and with special fleshing tool or a dull drawing knife, the fat and flesh are removed. The skin should not be scraped too closely but the areas around the mouth and ears must be thoroughly worked to remove all fat and flesh. Extreme care should be taken to avoid cutting the skin.

After fleshing, the pelt is drawn over the stretching frame with the flesh side out. The skin is pulled gently lengthwise into proper position. If the stretchers are made of wood, the base of the pelt is tacked "squared-off" across the bottom.

To dry the pelt hang up the frame or stretcher on which it is placed in a dry, shady place, where the air can circulate. A moderately warm atmosphere is best but not essential. Never dry a pelt in the sun or over direct heat, as it is likely to be burned and its value destroyed. All pelts should be kept hanging until they

An unusual picture of blue and snow geese on a mud flat near the mouth of the Mississippi River.

are thoroughly dry and the fat, oily moisture on the skin side has disappeared.

ACKNOWLEDGMENTS

The authors are especially grateful to the Animal Trap Company of America for designing, constructing, and furnishing experimental models of drying frames. Particular thanks are due to Armand P. Daspit and other officials of the Louisiana Department of Wild Life and Fisheries, for trapping permits and valuable suggestions and assistance; Mark Hebert, Manager of Louisiana Furs, Inc., at Belle Isle, Camp; and his trappers, Lawrence Borel, Ben Bertrand, Murphy Sellers, Alphe Choates, Lloyd Sagrera, Evine Guidry, Martel Hebert, and Luther Winch, trappers who tested the various models and made helpful suggestions and criticisms; Charles M. Parker, Manager of the Lacassine National Wildlife Refuge, Lake Arthur, La., and trappers, Robert Guidry and Lezea Monceaux; Mrs. F. E. Simmons of Avery Island, La., and trapper Lionel LeBlanc. Sincere thanks are due Joseph Shulof of Shulof and Company, Inc., New York, for his cooperation and critical reading of this paper.

Since the trappers have learned to properly stretch their nutria pelts they are getting much higher prices. In the 1949-1950 season they received approximately $3.00 per pelt, but in the 1950-1951 season they received $4.65 per pelt.

Our trappers are very enthusiastic about the nutria pelt and those who have eaten the meat seem to think that in time to come, with proper refrigerator service, the meat of these animals will become very much sought after—some say the meat is tasty, very much like pork.

Below is a comparison of the nutria take in Louisiana from the 1943-1944 season through the 1950-1951 season:

1943-1944	436
1944-1945	902
1945-1946	8,784
1946-1947	18,015
1947-1948	28,176
1948-1949	26,738
1949-1950	38,988
1950-1951	78,422

MINK

The wild mink is one of the more important animals of the American fur trade. It occupies a position among the carnivora, or flesh-eaters, somewhat similar to that held by the muskrat among the vegetable feeders. In numbers it is found in larger quantities in Louisiana than in any other state of the union.

While brown is the predominating color of the mink, the underjaw of the Louisiana mink is light yellowish brown and spots on the chest and underparts are pure white, although frequently stained yellowish.

A mink is known in the fur trade as the "French Settlement Mink," found in that section of the state covered by the parishes of Ascension, St. James, Livingston, Tangipahoa and St. John the Baptist, and in the general vicinity of Lake Maurepas, brings the highest price in the raw pelt market. The reason for this is not alone because of its rich dark-brown pelage, but because these animals grade evenly, and, when using French Settlement mink furriers do not have to spend time in matching tanned skins when making up a garment composed wholly of mink fur.

Mink producing parishes are Terrebonne, St. Mary, Lafourche, Cameron, Vermilion, Assumption, Plaquemines, St. Bernard, Calcasieu, Jefferson, Livingston, Tangipahoa, Natchitoches, DeSoto, Iberville, Rapides, Bossier, Caddo, Richland, St. John and St. James.

There was a large increase in the mink take in Louisiana in the past two years and the prices were high. In the 1949-1950 season 123,850 mink pelts were taken and the trapper received approximately $8.90 per pelt. In the 1950-1951 season 184,552 pelts were taken and the trapper received $13.00 per pelt, or the fabulous amount of $2,399,176.

RACCOON

The population of the salt water marsh raccoon is still on the increase in Louisiana, however, they will be very much reduced because of a new method of handling them. Many of our store owners along the Gulf Coast are buying *"fresh raccoon."* Raccoons that have been trapped are brought into the stores with their pelts on but the entrails removed. They are then skinned and sold for their meat, and the pelt, which is not worth a great deal, is sold separately. The price received by the trapper for a raccoon that is sold both for his meat and pelt is approximately one dollar. This method has induced the trapper to take a renewed interest in trapping raccoon.

The salt water marsh raccoon increased in such numbers in the past few years in Louisiana that it became a nuisance and in December, 1949, Commissioner Ernest S. Clements issued an

A prime specimen of Louisiana raccoon.

order to the effect that the yellowish, harsh furred raccoon of the marshes was declared to be an outlaw quadruped in the coastal parishes and may be destroyed at will. This is both an economic and a wildlife conservation measure.

The marsh raccoon is an outlaw only in the parishes of St. Tammany, Orleans, St. Bernard, Plaquemines, Jefferson, Lafourche, Terrebonne, St. Mary, Iberia, Vermilion, Cameron and Calcasieu. In these parishes, and in no others, it may be killed at any time.

The raccoon found in the vast hardwood lands and the cypress and tupelo swamps is not outlawed. It is much larger and has a darker pelt than the salt water 'coon and brings a much better price.

In the past year quite a few raccoon pelts have been used in the manufacture of 'coon skin caps.

It is illegal to hunt raccoons with guns, dogs and flashlights or headlights, as well as to purchase or possess at any time the pelt or skin which has been perforated with gunshot. It is also a violation of the law to hold in captivity a raccoon for use in training dogs.

OTTER

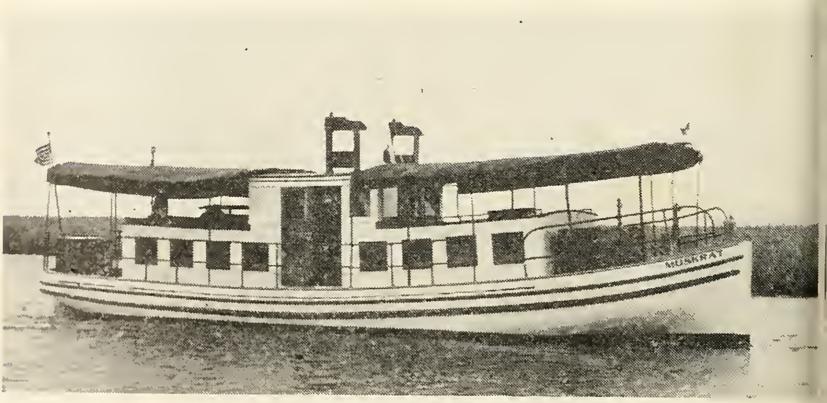
The otter was known to man, and its pelt used for a covering, long before America was discovered. Bayou la Loutre and Pass-a-Loutre were notable for the number of otters seen in them, and for this reason were so named.

The otter is a carnivorous aquatic mammal belonging to the lutrinae section of the Mustelidae family, a group that includes the minks, weasels, skunks, badgers and martens. It has a long, slender body, very short legs, stout, tapering tail and a flattened head. The otter has a pelt that is of a rich dark-brown color and commands a high price.

Of pronounced aquatic habits, being as fond of fresh water as the seal is of its favorite element, the otter is a marvelous swimmer, but it is quite at home on land, where it makes long journeys from one body of water to another.

In the 1949-1950 season 2,968 otters were taken and the average price to the trapper was $8.00 per pelt; in the 1950-1951 season 4,801 otters were taken and the price to the trapper was $12.15. It would appear that the otter is holding its own both in number and price.

The opposum, skunk and fox have been on the increase in Louisiana. The pelts of these animals are not of great value.



The patrol boat "Muskrat"

Below is listed the fur take in Louisiana and the approximate prices at point of severance in the 1949-1950 and 1950-1951 seasons:

1949-1950 SEASON

Muskrat	2,195,324	@	$ .77	$1,690,399.48
Nutria	38,988	@	3.00	116,964.00
Mink	123,850	@	8.90	1,102,265.00
Raccoon	73,035	@	.27	19,719.45
Opossum	16,361	@	.20	3,272.20
Otter	2,968	@	8.00	23,744.00
Skunk	302	@	.15	45.30
Fox	226	@	.15	33.90
Cat	87	@	.15	13.05
Miscellaneous	142	@	.15	21.30
	2,451,283			$2,956,477.68

1950-1951 SEASON

Muskrat	2,477,464	@	$ 1.25	$3,096,830.00
Nutria	78,422	@	4.65	364.662.30
Mink	184,552	@	12.93	2,386,257.36
Raccoon	104,420	@	.43	4[illegible],900.60
Opossum	27,308	@	.21	5,734.68
Otter	4,801	@	12.15	58,332.15
Skunk	1,006	@	.15	150.90
Fox	1,250	@	.25	312.50
Cat	58	@	1.05	60.90
Miscellaneous	41	@	.15	6.15
	2,879,322			$5,957,247.54

ALLIGATOR TAKE IN LOUISIANA

Year	Under 5 feet	Over 5 feet	10 feet or over	Total
1949-1950	22,959	6,919	36	29,914
1950-1951	27,696	8,108	92	35,896

REVENUES RECEIVED IN THE FUR AND REFUGE DIVISION IN THE 1949-1950 SEASON

Resident Fur Dealer's Licenses	35	@	$ 150.00	$ 5,250.00
Non-Resident Fur Dealer's Licenses	1	@	300.00	300.00
Resident Fur Buyer's Licenses	214	@	25.00	5,350.00
Non-Resident Fur Buyer's Licenses	0	@	100.00	....
Trapper's Licenses	7110	@	2.00	14,220.00
Total amount of tax collected from Fur Dealers and Fur Trappers				49,776.23
Total				$74,896.23

The Fur and Refuge Division does not receive one penny of the above revenue. These revenues are turned over to the general fund of the Department of Wild Life and Fisheries.

Total revenues received from the sale of furs taken from the State Game Refuges, Marsh Island, State Wildlife and Rockefeller Refuges:

Total amount of fur sales	$ 49,395.27	
Less trappers' 65%	32,106.92	
Department's 35%		$ 17,288.35
Department's 35% of revenues received from the sale of furs taken from St. Tammany Refuge		171.56
Department's 25% of revenues received from the sale of alligators taken from Marsh Island		174.92
Department's 25% of revenues received from the sale of alligators taken from State Wildlife		6.63
Department's 25% of revenues received from the sale of alligators taken from Rockefeller Refuge		84.61
Revenue received from pasturage on the State Game Refuge		1,846.00
Total		$ 19,572.07
Grand Total		$ 94,468.30

REVENUES RECEIVED IN THE FUR AND REFUGE DIVISION IN THE 1950-1951 SEASON

Resident Fur Dealer's Licenses	37	@	$ 150.00	$ 5,550.00
Non-Resident Fur Dealer's Licenses	2	@	300.00	600.00
Resident Fur Buyer's Licenses	232	@	25.00	5,800.00
Non-Resident Fur Buyer's Licenses	1	@	100.00	100.00
Trapper's Licenses (estimated)	8000	@	2.00	16,000.00
Total amount of tax collected from Fur Dealers and Fur Trappers				54,894.38
				$ 82,944.38

The Fur and Refuge Division does not receive one penny of the above revenues. These revenues are turned over to the general fund of the Department of Wild Life and Fisheries.

Total revenues received from the sale of furs taken from the State Game Refuges, Marsh Island, State Wildlife and Rockefeller Refuges:

Total amount of fur sales	$ 77,965.72	
Less Trapper's 65%	50,677.72	
Department's 35%		$ 27,288.00
Department's 35% of revenues received from the sale of furs taken from St. Tammany Refuge		1,287.59
Department's 25% of revenues received from the sale of alligators taken from Marsh Island		137.34
Department's 25% of revenues received from the sale of alligators taken from State Wildlife		44.25
Department's 25% of revenues received from the sale of alligators taken from the Rockefeller Refuge		331.70
Department's 25% of revenues received from the sale of alligators taken from Pass-a-Loutre Public Shooting Grounds		25.04
Revenues received from pasturage on the State Game Refuges		1,957.00
Total		$ 31,070.92

REVENUES RECEIVED FROM STATE MINERAL LEASES AND GEOPHYSICAL PERMITS—1950 AND 1951

State Lease No.	Tract No.	Date	Refuge	To Whom Leased	Amount
1814	4531	3-30-1950	Marsh Island...	Shell Oil Co.......	$ 254,000.00*
1890	4672	11-29-1950	Pass-a-Loutre..	The Texas Co.....	93,854.07*
1913	4714	3-29-1951	Pass-a-Loutre..	Gulf Refining Co...	136,499.31
1927	4734	3-29-1951	Pass-a-Loutre..	Humble Oil & Refining Co......	223,950.25
1928	4735	3-29-1951	Pass-a-Loutre..	Shell Oil Co........	77,356.00
2382		7-27-1950	Rockefeller.....	Superior Oil Co....	224,460.00
Total					$1,010,119.63

* The above amounts have been paid to this Department and credited to the Fur and Refuge Division.

Of the above amount $366,324.05 has been deposited to the credit of the Fur and Refuge Division of the Department of Wild Life and Fisheries. The balance of $643,795.58 is still deposited with the State Treasurer but has not been transferred to this Department.

Included in the payment of $366,324.05 is an amount of $17,969.98 deposited to the credit of the Fur and Refuge Division on March 19, 1951, which covered a cash bonus and rental on State Lease No. 1606, Tract No. 4047, on our Pass-a-Loutre property to the California Company on July 6, 1948. Although this amount was deposited with the State Treasurer at that time it was not credited to the Fur and Refuge Division until March 19, 1951.

Revenues received from the sale of licenses and fur tax....	$ 82,944.38
Revenues received from the sale of furs, alligators and pasturage..	31,070.92
Revenues received from State Mineral Leases and Geophysical Permits..	1,010,119.63
Grand Total..	$1,124,134.93

WILDLIFE SANCTUARIES

Commissioner Ernest S. Clements and the Director of the Fur and Refuge Division have been intensely interested in our wildlife refuges and have devoted a great deal of time and attention to Marsh Island, State Wildlife Refuge and the Rockefeller Refuge, as well as the St. Tammany Refuge and our upland game preserves, the Chicago Mill and Lumber Company Refuge, formerly the Singer Refuge, Morehouse Game Refuge and the Pass-a-Loutre Public Shooting Grounds.

Our primary objective is to see that the migratory waterfowl is protected and that the ducks, geese and other birds and animals have an abundant supply of food.

We have well built keepers' camps on Bird Island Bayou on Marsh Island, and Red Fish Point on the State Wildlife Refuge. They are very comfortable for the resident keepers who remain

A Louisiana trapper drying his furs on the State Wild Life Refuge.

on the refuges. These camps are built of good cypress lumber, well anchored down, properly screened and sealed, and are kept in first class condition.

In addition to having our agents who patrol these preserves regularly, the keepers are supplied with boats and high speed outboard motors in order to intercept any violations that might occur. We are pleased to note, however, that violations have been very few due to the fact that the laws have been strictly enforced and strict supervision is being given at all times.

On the Rockefeller Refuge in Cameron Parish we have two keepers' cottages and two garage apartments with space for fur storage and two automobiles each. One of these cottages is on the east end of the refuge and the other on the west end.

We have recently employed a biologist, Mr. Lonnie M. Sibley, a graduate of Louisiana State University with a M. A. Degree, to make a study of the bird life, the marshes, the fur animals and other wild life on our game refuges.

Mr. Sibley and his family are occupying the East End Cottage on the Rockefeller Refuge and he is using one of the garages for his laboratory which is being fully equipped.

The largest winter wildlife sanctuaries in the world are located in Louisiana and are the first migratory waterfowl refuges to be established and owned by any state or national government. The geographic position of Louisiana makes it an important bird state and each year it affords a vast assembling place for great hoards of migratory waterfowl and shorebirds.

Located in this state are the following winter migratory waterfowl refuges:

West end garage apartment and warden's cottage on the Rockefeller Refuge, at Grand Chenier, La.

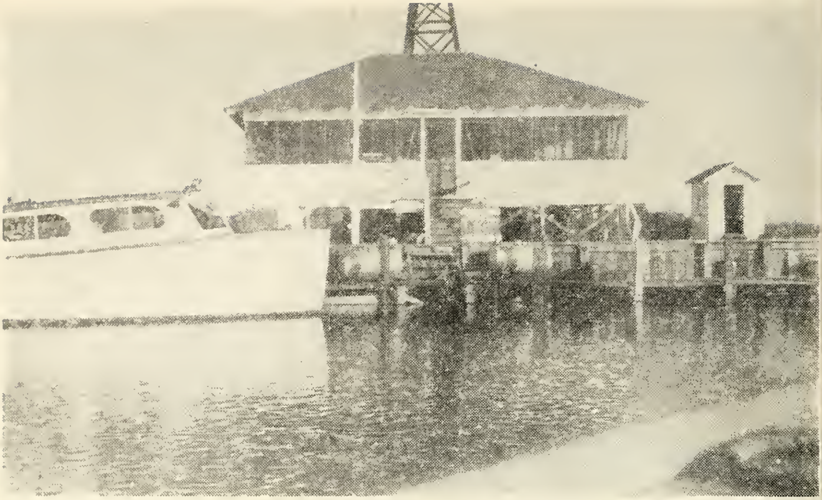
MARSH ISLAND (Russell Sage Wildlife Refuge) is located in Iberia Parish and comprises 79,000 acres.

STATE WILDLIFE REFUGE is located in Vermilion Parish and comprises 13,000 acres. This refuge lies west of Marsh Island and adjoins the Rainey Refuge.

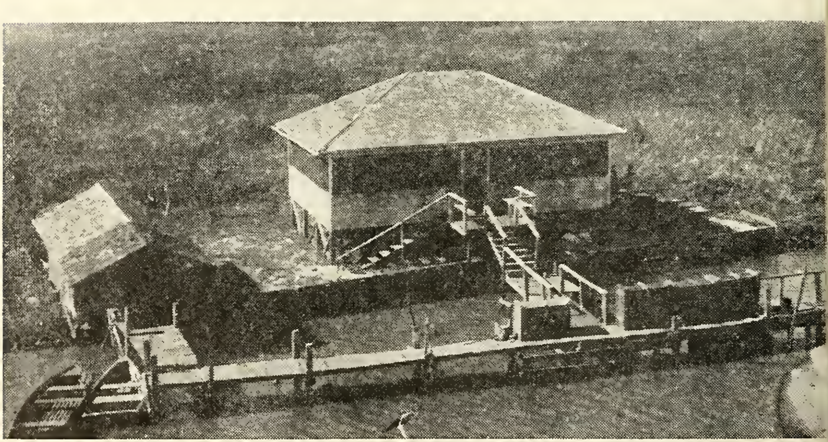
ROCKEFELLER REFUGE is located in Cameron and Vermilion Parishes and comprises 85,000 acres of marshland with the Gulf of Mexico on the South.

ST. TAMMANY REFUGE is located in St. Tammany Parish and comprises 6,000 acres.

PASS-A-LOUTRE GAME AND FISH PRESERVE AND PUBLIC SHOOTING GROUNDS, was donated to the Department of Wild Life and Fisheries by an act of the Legislature in 1921. It comprises 66,000 acres located at the mouth of the Mississippi River in Plaquemines Parish. Besides being a



'Warden's camp at the State Wild Life Refuge.



Warden's camp on Bird Island Bayou, on the Marsh Island refuge.

desirable public shooting ground, on which the state's hunting club is located, it has proved to be one of the largest and most profitable oil fields in Louisiana. Sulphur is being developed on this property at the present time.

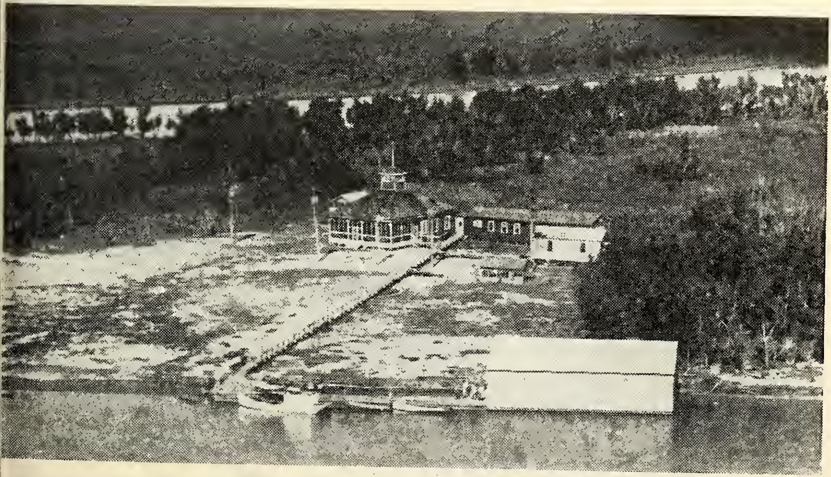
Louisiana not only has migratory waterfowl refuges but has established the following upland game preserves which are for the propagation of upland game birds of all descriptions:

CHICAGO MILL AND LUMBER COMPANY (formerly the Singer Game Refuge) is in Madison Parish. This refuge owned by the Chicago Mill and Lumber Company, is leased as a refuge on a ten-year basis. There are approximately 35,000 acres under refuge regulations. The wildlife consists of large quantities of deer and wild turkeys and the few remaining Ivory-billed woodpeckers. The Fisher-Ayers Wildlife Refuge joins it on the South from the Tensas Parish Line.

FISHER-AYRES WILDLIFE REFUGE is located in Tensas and Madison Parishes, and is leased on a ten-year basis from the Fisher-Ayres Corporation and includes approximately 22,000 acres. It harbors large quantities of deer and wild turkeys, besides numerous smaller animals.

MOREHOUSE REFUGE in Morehouse Parish is owned by the Crossett Lumber Company and is leased to the state on a ten-year basis. This refuge contains 58,000 acres and is the most northerly refuge in this state, being about a mile from the Arkansas Line. There are very large herds of deer, a few turkeys and numerous smaller game. It has a perfect system of patrol roads throughout the area. The Crossett Lumber Company is very cooperative with us in maintaining the refuge.

Each year it is necessary to trap the predatory animals on the game refuges in order to save the food for the migratory ducks, geese, grackles, etc. as well as the birds themselves.



Club house and adjoining buildings on the Pas a' Loutre game and fish reserve and public shooting grounds in lower Plaquemines Parish.

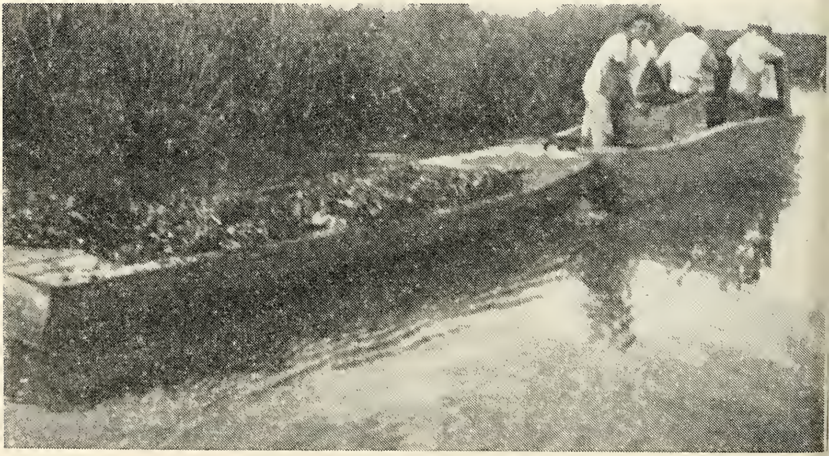
Just before the trapping season opens, trappers are selected by our superintendents and they and their families are moved out on the refuges and given trappers' camps in which to live while they are trapping.

Our superintendents and wardens patrol these refuges constantly to see that there are no violations while the trappers are on the preserves. The furs trapped are picked up regularly and transported by boat to our warehouse in New Iberia. Our warehouseman counts and grades the furs and piles them in lots in our warehouse.

Each time the superintendent picks up furs he gives the trapper a receipt. These trappers' pickup books are made up in triplicate, the trapper gets one, one is sent to the main office after each sale, and the third remains in the book. These books are returned to the office at the end of the trapping season.

After the furs are counted and graded the warehouseman notifies the New Orleans office, who in turn circularizes the entire fur trade, advising them the number of pelts to be sold, the time and place of sale. The furs are sold to the highest bidder for cash.

After the sale, complete information is forwarded to the New Orleans office where tabulations are made and bills prepared for the trappers' portion of the furs sold. The trapper receives 65% and the Department 35%.



Hauling a boatload of banana water lilies and wild celery to the Rockefeller refuge for transplanting for duck and goose food.

DUCK FOODS ON GAME REFUGES

Louisiana is justly famed for the large number of wild fowl that partake of her hospitality every season. Many factors contribute to this condition, and not the least among them being the abundance of food in our marshes at all times.

There is practically every type of aquatic habitat known within the sphere of brackish marshes on both Marsh Island and State Wildlife Refuges.

In order to maintain a sufficient amount of migratory waterfowl food on our game refuges, Marsh Island, State Wildlife, Rockefeller and Pass-a-Loutre, we have instituted an extensive duck food planting program which has proven very satisfactory. Among the foods planted were:

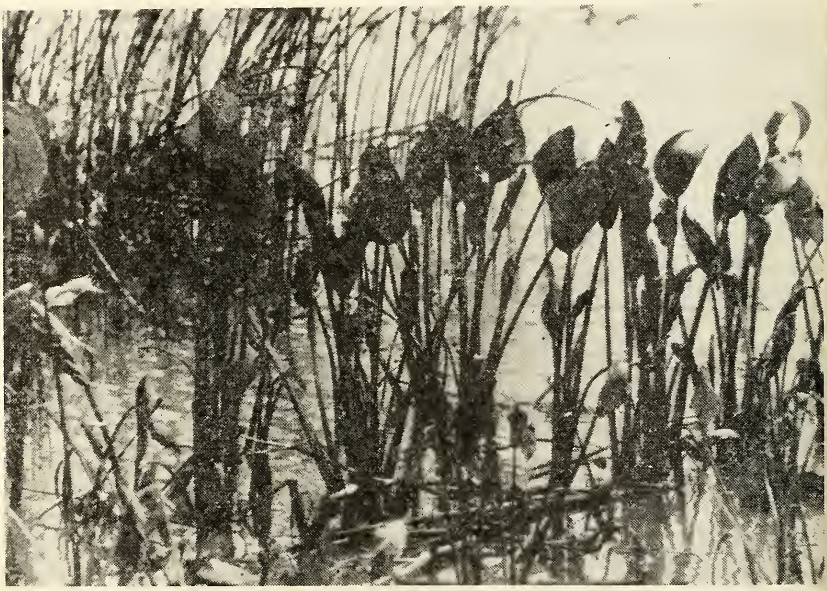
WILD RICE: (Zizania Aquatica). Eaten in every stage of its growth by a number of ducks and geese and all species feed on its ripened grain. It is generally distributed throughout the state excepting the extreme northwestern part of the state. This is perhaps the most important of the natural duck foods.

WILD CELERY: (Vallisneria spiralis) A food from which the great flocks of canvasback ducks obtain one-fourth of their food while here every winter. It is quite generally distributed, being especially plentiful near the mouth of the Mississippi River and on the various lakes and lagoons of the big Wild Life Refuges. Besides being especially attractive to Canvasbacks, Redheads, Baldpates, the Scaups or Dos-gris and Ruddy ducks make it an important item on their winter bill of fare. Wild celery taken from Lake Catherine has been grown successfully in the ponds, but seed gotten from the north was not a success.

DELTA DUCK POTATO: (Sagittaria platyphylla). An important natural duck food known to hunters as "wild potato" or "wild onion" and confined to the area of the ancient basin of the vast bay into which the Mississippi once emptied. It is to be found throughout the state, more especially at the delta of the great river. It grows tubers and these are the prized food of the canvasback, the mallards, the pintail and other large ducks. This food can be successfully grown in shallow ponds of not over 24 inches in depth.

BANANA WATER LILY: (Nymphaca Mexicana) A most important duck food in the lowlands of the state. It is known as the best all-around duck food in North America. Not only

A crew planting duck food in Bird Island Lake.



A new crop of delta duck potatoes, food for ducks and geese during the winter months, near the mouth of the Mississippi River.

is it attractive to the shoal-water ducks but the diving ducks—scaups, ring-necks or blackjacks, canvasbacks and redheads, leave their deep water havens to feed upon it. This is the prize food, undoubtedly, for baiting preserves or refuges. It is found only along the coast, being especially abundant on Marsh Island and the State Wildlife Refuge.

WIDGEON-GRASS: (Ruppia Maritima). Quite like the Sago Pondweed. It is sometimes in this state called the "Poule d'eau grass" because of the liking the coot has for it. It is a brackish-water plant and can also be considered an important duck food.

WILD MILLET: (Echinochloa crus-galli). Almost as important in Louisiana as the wild rice—a name by which this particular plant is also known in the lowlands. In Cameron and Calcasieu Parishes, particularly on the Rockfeller Wildlife Refuge the wild millet grows in profusion. Pintails, teals, mallards and other shoal-water ducks are very fond of it and the great flocks of geese that congregate there feed on the stems and leaves. It has a wide distribution throughout the state in the swamps and other rich moist soils. The food is known in Southern Louisiana as Riz de lane.

Most of the duck foods that were planted on the Rockefeller Refuge were taken from the State Wildlife Refuge in Vermilion Parish and transferred by boat to the Rockefeller Refuge in Cameron Parish some fifty miles away.

Three-cornered grass (goose grass) at the mouth of the Mississippi River on which the blue geese feed during the winter months.

OIL LEASES AND GEOPHYSICAL PERMITS ON STATE GAME REFUGES

The deeds of donation of the Russell Sage Foundation Refuge (Marsh Island—Iberia Parish), the Rockefeller Foundation Refuge—Vermilion and Cameron Parishes, and the Pass-a-Loutre Game and Fish Preserve and Public Hunting Grounds, Plaquemines Parish, permit the Louisiana Department of Wild Life and Fisheries to conduct explorations for oil, gas or other minerals on these properties. Such exploration is to be done however so as to cause the least disturbance to wild life, and if such explorations develop the presence of oils, gas and other minerals, the oil, gas and other minerals may be mined and developed.

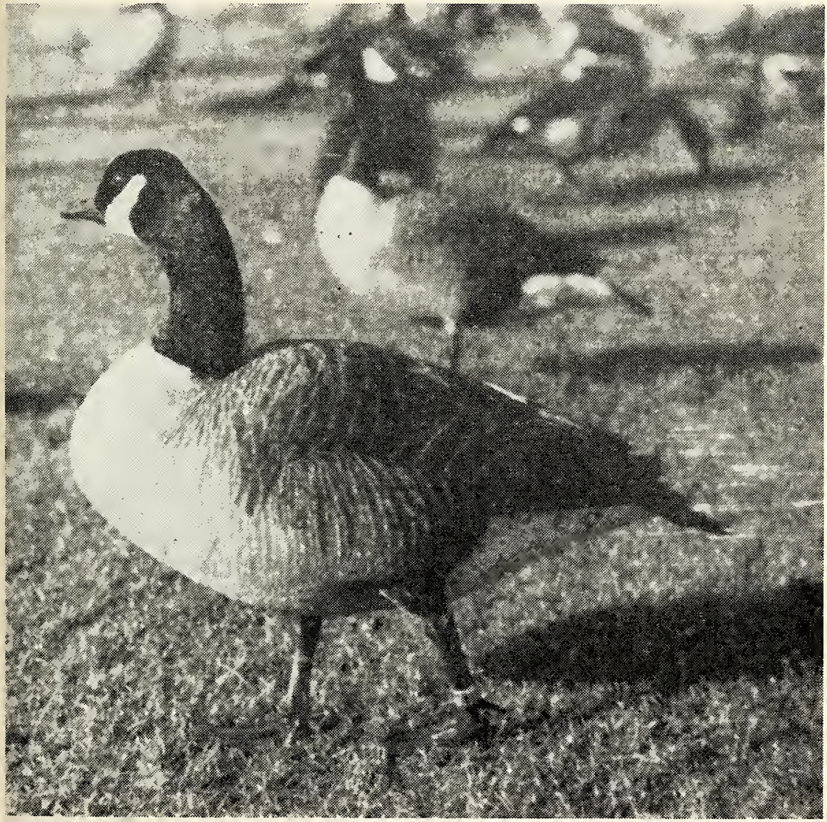
The revenues derived from the oils, gas and other minerals mined and developed are first to be used for the purpose of paying the expense of the maintenance, policing and improvements of these wild life refuges, and the development of conditions suitable for improving these wild life refuges.

The following leases were made in the years 1950-1951:

State Lease No.	Tract No.	Date	Refuge	To Whom Leased	Amount
1814	4531	3-30-1950	Marsh Island	Shell Oil Co.	$ 254,000.00
1890	4672	11-29-1950	Pass-a-Loutre	Texas Co.	93,854.07
1913	4714	3-29-1951	Pass-a-Loutre	Gulf Refining Co.	136,499.31
1927	4734	3-29-1951	Pass-a-Loutre	Humble Oil & Refining Co.	233,950.25
1928	4735	3-29-1951	Pass-a-Loutre	Shell Oil Co.	77,356.00
2038	4911	9-27-1951	Rockefeller	Superior Oil Co.	2,070,998.00
2039	4913	9-27-1951	Rockefeller	Superior Oil Co.	383,998.00
			GEOPHYSICAL PERMIT		
2382		7-27-1950	Rockefeller	Superior Oil Co.	224,460.00
					$3,475,115.63

The digging of canals through these various properties have made them more accessible than they were previous to the oil development and for this reason it is imperative that we build suitable cottages at the entrance of each one of the main canals in order that they may be made comfortable enough for permanent wardens and their families to live in. By having the wardens' families live in the cottages they will be on the property at all times and we can have more rigid enforcement of the conservation laws, especially on week ends when most people go hunting and fishing.

The Shell Oil Company has already, without charge, completed an elevation at the entrance of Bird Island Bayou on Marsh Island and the Superior Oil Company has agreed to do likewise on the Rockefeller. Later we will ask for bids on the construction of these cottages.



Beautiful specimens of white front, or speckled belly geese, wintering in Louisiana.

An unusual picture of blue and snow geese, taking off from their feeding grounds.

FRESH AND SALT WATER FISHERIES

W. S. WERLLA, *Supervisor of Revenues*

William Werlla

THE duties of this section are to collect the revenues, issue all licenses, audit the books of all individuals and concerns, keep the records and statistics and compile the reports. It is the purpose of this report to give statistical data for the past two fiscal years, in addition to showing statistics, in some instances, as far back as the year 1908 as a basis for comparison.

Records of revenue collections show that in the fiscal year 1938-39 the Department spent more than $3.25 for every $1.00 of revenue collected; whereas, during the last fiscal year more than $2.00 was collected for every $1.00 spent.

This increase in revenue was not due to a raise in tax rates or license fees, for, with two minor exceptions, the tax and license fees are the same as 25 years ago. The increase was due to proper supervision, increased production, stricter enforcement, better laws, education, checking, and keeping of accurate records and regular audits.

Without the full cooperation of every division in the Department this section would be handicapped in its collection of revenues. It is vital that the State Legislature continue to revise and pass laws designed to protect and increase this revenue in order to meet the expansion of this Department.

Fish, oysters, shrimp, fur animals and all game are the property of all the people in this state and shall so remain until sold as the law prescribes.

The fish, oysters, shrimp, and fur animals in the coastal parishes equally belong to the people of other parishes just as the quail, turkey, deer and other game in northern Louisiana is the equal property of the people in south Louisiana. There are commercial fresh-water fish in north and south Louisiana, game and sport fish equally in both sections.

Sportiest of the sports fishermen are those who participate in the Grand Isle Tarpon Rodeo each year. Here is the 1951 Champion, Stanley Tinney, of Boutte, La., (center) with Urban Wilkinson, general chairman (left) and Hugh Wilkinson, originator of the rodeo and donor of the championship trophy each year.

These interests are so interwoven that there must be complete agreement on their supervision. One should not be allowed to govern the other but all should cooperate for the best interests of the whole state.

The commercial industry as well as the sport fishermen and hunters, for the past nine years, have been paying their own way. They pay all of the same taxes which every other person in this state pays, but in addition they put up an additional amount to pay for the cost and development of the industry. They do not ask the other taxpayers to contribute to the Department of Wild Life and Fisheries, for it is on a paying basis. Because some interests, within the industry, paid little or nothing at all, it becomes necessary for other interests to make up for their cost of operation.

The tax and license structure of the Department should be reviewed and revised, in some instances taxes and licenses are too high, in others there are no taxes or licenses. It is not fair for one interest to be taxed at the expense of others.

In a true sense, the words "taxes and licenses," are not the proper titles for the cost these persons or industries pay. It is the purchase price that is paid for a product that belongs to all the people of this state. If this purchase price is too low or there is no charge whatever, then some adjustment should be made. It should not be considered as a raising or lowering of taxes but the price asked by the state for its people's property, to protect, to propagate and insure the continued development of a way of life that is a heritage, passed down through the ages, not only for this generation but for generations to come.

Few people realize the magnitude of the commercial fishing, shrimping, oyster, fur, sand, gravel, shell, and other combined industries in this state. This report deals with revenue and valuation in the commercial fishing and shrimping industry, which are estimated at $110,000,000.00 value to the state. Statistics on sport fishing and hunting licenses sold, with an estimated valuation of $53,000,000.00 in equipment, will be found in this report.

The Gulf States Marine Fisheries Compact, dealing with commercial fishing, shrimping and oysters, which was signed in 1948 by the five Gulf states is of major consideration. Production of shrimp by these states, and comments on the compact are shown in tabulated statistics.

Oysters, sand, gravel, shell, the fur industry, etc., would probably equal or exceed the valuation shown for commercial fishing and shrimping. These are shown in other parts of the biennial.

The commercial fishing, shrimping, oyster and fur industry of Louisiana are unequaled anywhere in the United States. It is difficult to name another state to compare with Louisiana's advantages for sport fishing and game hunting. Our state is often referred to as the last frontier for natural game.

Because Louisiana has such a preponderance of fish and game, it also has greater problems concerning supervision, regulation, and law enforcement in these industries.

It is very difficult to get certain sections of the state to agree on laws, seasons, etc. Shrimp fishing alone is conducted in seven separate areas which have never been in complete agreement as to season, size and waters. All of the interests concerned should endeavor to cooperate in order to solve these problems for the benefit of everyone.

The following tables of statistics and explanation are submitted in support of the above comments.

TABLE NO. 1

REVENUES DERIVED FROM COMMERCIAL FISHING AND SHRIMPING

From Wholesale Dealers, and Agents, Retail Dealers of Fish and Shrimp

	1949-50	1950-51
Wholesale Fish and Shrimp Dealers	$16,700.00	$16,250.0
Wholesale Fish and Shrimp Dealer's Agent	1,160.00	1,180.0
Retail Fish and Shrimp Dealers	10,725.00	12,710.0
TOTAL	$28,585.00	$30,140.0

Table "No. 1" shows the revenue derived from wholesal and retail dealers in fish and shrimp and their agents for th past two fiscal years. This class of license is combined, permittin the owner to handle fresh and salt-water fish, also all other se foods with the exception of oysters. A wholesale dealer's licens sells for $50.00, retail dealer's, $5.00, and agent's license fo $10.00. Only wholesale dealers are permitted to export fish o sea-food out of this state. The agents are permitted to purchas for one wholesaler only. The retail dealer may sell direct to th consumer only within Louisiana.

TABLE NO. 2

NETTING LICENSES

Commercial

Fresh Water Fisheries

	1949-50	1950-51
Commercial Fishermen (Bait Sellers, Trot Lines, etc.)	$ 3,755.00	$ 3,750.00
Hoop Nets	7,585.00	6,830.00
Seines	3,050.00	2,680.00
Trammel Nets	2,965.00	2,130.00
Gill Nets	6,590.00	7,175.00
TOTAL	$23,945.00	$22,565.00

TABLE NO. 3

Salt Water Commercial Fish

	1949-50	1950-51
Fish Seines	$ 1,795.00	$ 1,635.00
Fish Trammel Nets	1,600.00	1,330.00
TOTAL	$ 3,395.00	$ 2,965.00

TABLE NO. 4

NUMBER OF FISH NETTING LICENSES SOLD DURING THE YEAR 1951

Fresh Water Licenses	Number
Trot Lines, Bait Sellers, Bait Seines, etc.	685
Hoop Nets	19,760
Seines, Fish	109
Trammel Nets	168
Gill Nets	612
TOTAL	21,334

Salt Water Licenses	Number
Seines, Menhaden	46
Seines, Fish	29
Trammel Nets	109
TOTAL	184

Table No. 2 specifies the amount of revenue derived during the past two fiscal years from sale of freshwater netting licenses.

Table No. 3 is the revenue from salt water netting licenses, and includes 46 menhaden seines with the salt water fish seines.

Table No. 4 shows the total number of fresh and salt water nets for the year 1951.

TABLE NO. 5

FISH PRODUCTION

FISCAL YEARS JULY 1949 THRU JUNE 1951

FRESH WATER FISHERIES:

Type of Fish	Production Fiscal Year 1949-50	Valuation	Production Fiscal Year 1950-51	Valuation
Catfish	6,193,986 lbs.	$1,703,346.15	6,999,231 lbs.	$1,924,788.53
Gaspergou	2,012,953	301,942.95	2,217,873	332,680.95
Spoonbill Cat	128,859	45,100.65	246,998	86,449.30
Buffalo	3,435,836	515,375.40	3,043,632	456,544.80
Gar Fish & Common Commercial Fish	864,330	129,199.50	982,492	147,373.80
River Shrimp	36,777	14,710.80	61,860	24,744.00
Fresh Water Turtles	100,837	10,083.70	98,467	9,846.70
Frogs	53,726	26,863.00	63,377	31,688.50
Crayfish	162,056	48,616.80	560,406	168,121.80
Total lbs.	12,936,360		Total lbs. 14,274,336	
Diamond Back Turtles	200 Doz.	1,300.00	17 Doz.	110.50
Baby Green Turtles	699,486 Each	69,948.60	1,663.007 Each	166,300.70
		$2,866,487.55		$3,348,649.58

TABLE NO. 6

SALT WATER FISHERIES:

Type of Fish	Production Fiscal Year 1949-50	Valuation	Production Fiscal Year 1950-51	Valuation
Speckled Trout	706,839 lbs.	$ 282,735.60	639,355 lbs.	$ 255,742.00
Red Fish	324,179	97,253.70	264,972	79,491.60
Sheephead	115,697	20,825.46	88,037	15,846.66
Flounder	166,792	41,698.00	120,904	30,226.00
Red Snapper	96,816	33,885.60	27,129	9,495.15
Common Salt Water Fish	356,194	71,238.80	422,047	84,409.40
Sea Turtles	5,324	479.16	6,066	545.94
Crab Meat	6,104	6,409.20	11,279	11,842.95
Hard Shell Crabs	10,848,565	867,885.20	9,359,315	748,745.20
Mullets	868,374	86,837.40	757,398	75,739.80
Drum	344,269	86,067.25	944,969	236,242.25
	13,839,153 lbs.		12,641,471	
Soft Shell Crabs	13,845 Doz.	41,535.00	19,767 Doz.	59,301.00
		$1,636,850.37		$1,607,627.95
MENHADEN—Year 1950			287,370,535 lbs.	$5,954,646.00

Tables Nos. 5 and 6 list the number of pounds of fresh and salt-water fish produced, and the approximate value of same during the past two fiscal years.

Our laws do not provide for a tax on any type of commercial fish, the only revenue derived is from the sale of licenses on netting. The production shown is from reports by wholesale dealers and some retail dealers, it does not include such fish as are sold by producers direct to the consumer or millions of pounds taken by individuals for their own consumption. Louisiana does not require an angling license from resident persons taking fish for their own consumption, unless using rod and reel or artificial bait, nor does any person in the armed services of the United States, regardless of where stationed, or any person over 60 or under 15 years of age need a license.

There are no game fish included in this report as their sale is prohibited.

During the past few years, by special order of the Commissioner, some areas East of the Mississippi River, including the Chandeleur Island, Mitchell Keys, Breton, Hog and other islands, have been closed to commercial netting from March 15th to June 1st. This was found necessary because fish, especially Speckled Trout, use these areas to spawn. To drag netting over these grounds while these fish are spawning would destroy billions of eggs, in addition to catching fish full of roe. If eggs deposited in this area are allowed to hatch, the small fish will move to inside waters, grow and be of legal size within a few months.

Commercial seining is not allowed at any time in Plaquemine Parish for the same reason.

TABLE NO. 7

REVENUE FROM SHRIMP FISHERIES LICENSE & TAX

	1949-50	1950-51
Trawl and Vessel Licenses	$ 49,715.00	$40,112.00
Shrimp Seines	30.00	....
Freight Boats	2,710.00	2,160.00
Non-Resident Shrimp Fishermen	1,000.00	....
Severance Tax	76,026.55	64,986.50
	$129,481.55	$107,258.50

Table No. 7 itemizes the revenue collected during the past two fiscal years from the shrimping industry.

TABLE NO. 8

SHRIMP PRODUCTION AND NUMBER OF TRAWLS AND/OR SEINES

Calendar Year	No. Barrels Shrimp (210#)	No. of Seines	No. of Trawls Fiscal Year	No. of Trawls Calendar Year
1908	40,857			
1913	50,000	131		
1914	52,381	250		
1915	57,143	268		
1916	85,714			
1917	57,143	?		4
1918	71,429	300		17
1919	76,190			
1920	152,381	97		499
1921	163,012	135		983
1922	109,050	111		699
1923	153,759	128		1,021
1924	150,624	143		905
1925	154,722	180		1,010
1926	123,967	143		692
1927	150,896	120		913
1928	195,303	261		1,454
1929	210,033	125		1,486
1930	197,550	172		1,176
1931	178,815	126		1,131
1932	152,373	66		699
1933	166,058	67		1,045
1934	226,576	107		1,441
1935	252,981	125		1,433
1936	286,749	30		1,920
1937	362,942	35		2,313
1938	363,656	13		1,662
1939	395,050	26		1,621
1940	397,189	5		
1941	554,354	5	3,028	
1942	489,173	4	2,380	
1943	441,445	4	2,101	
1944	544,378	4	1,866	
1945	495,994	4	2,373	
1946	464,981	4		3,030
1947	365,617	4		3,200
1948	376,605	4		3,408
1949	376,040	4		3,310
1950	361,365	3		2,819
1951	396,980	0		2,248

Table No. 8 shows the number of trawl and shrimp seine licenses collected and the number of barrels of shrimp produced annually from 1908 through 1951.

Production of shrimp for the year 1951 was the highest since 1946 and with proper supervision and laws even greater catches will be made. The reason for listing the production from the year 1908 to date is to call attention to progress made by this industry. In 1908 the value of the catch to the producer was approximately $122,000. Today the catch is valued at $18,000,000.

TABLE NO. 9

SHRIMP PRODUCTION LANDED IN EACH PARISH FOR THE YEARS 1950 AND 1951

1950

Area Production	Whole	Headless	Canned	Dried	Cooked & Peeled	Total Bbls.
Louisiana Shrimp Processed in Mississippi	......	9,859.5	24,450.0	......	......	34,309.5
French Market	29,240.7	298.5	36.0	......	......	29,575.2
New Orleans Area, St. Bernard and Plaquemines Parish*	3,371.6	13,198.7	17,379.2	......	7,003.2	40,952.7
Lafourche Parish	2,527.8	33,536.0	2,904.0	......	2,778.0	41,745.8
Terrebonne Parish	1,791.2	24,568.2	23,211.9	41,246.7	23,497.3	114,315.3
Jefferson Parish	2,129.0	23,262.1	20,327.0	6,947.7	3,015.2	55,681.0
St. Mary Parish and all other Parishes to Texas Line	2.0	37,516.5	3,024.0	......	4,243.2	44,785.7
TOTAL	39,062.3	142,239.5	91,332.1	48,194.4	40,536.9	361,365.2

1951

Area Production	Whole	Headless	Canned	Dried	Cooked & Peeled	Total Bbls.
Louisiana Shrimp Processed in Mississippi	......	13,199.5	22,774.2	......	......	35,973.7
French Market	20,552.7	......	......	......	......	20,552.7
New Orleans Area, St. Bernard and Plaquemines Parish*	2,008.7	13,772.0	24,312.8	......	117.3	40,210.8
Lafourche Parish	4,651.5	54,605.3	2,810.0	......	1,435.0	63,501.8
Terrebonne Parish	845.2	46,255.6	28,848.3	34,742.7	22,981.8	133,673.6
Jefferson Parish	26.5	29,685.7	14,433.4	3,618.1	1,932.0	49,695.7
St. Mary Parish and all other Parishes to Texas Line	176.5	47,761.9	2,008.0	278.5	3,146.4	53,371.3
TOTAL	28,261.1	205,280.0	95,186.7	38,639.3	29,612.5	396,979.6

* These parishes are combined because shrimp mostly trucked to New Orleans area for processing and whole fresh sale.

Up to 1917 shrimp fishermen used large seines, 300 being in use, then shrimp trawls were introduced, now over 3,000 boats and trawls are in Louisiana waters, and this year after 44 years, shrimp seines are no longer used.

Table No. 9 lists production of processed shrimp from each area within the state. The shrimp shown for "French Market" come from all areas within this state and are principally sold for New Orleans consumption.

TABLE NO. 10

SIZE AND NUMBER OF SHRIMP VESSELS & TRAWLS REGISTERED FROM EACH PARISH, YEAR 1950

Parish	Size up to 45 ft.	Size 45 ft. & over	Total
Calcasieu	35	20	55
Cameron	24	5	29
Iberia	57	27	84
Jefferson	263	33	296
Lafourche	237	107	344
Orleans	38	3	41
Plaquemine	201	41	242
St. Bernard	212	23	235
St. Charles	20	...	20
St. Mary	76	136	212
St. Tammany	48	24	72
Tangipahoa	3	...	3
Terrebonne	610	82	692
Vermilion	27	6	33
TOTAL	1,851	507	2,358
Mississippi	281	180	461
GRAND TOTAL	2,132	687	2,819

Table No. 10 designates the number of vessels registered from each of the coastal parishes in the state during 1950 and the length of the vessels. The vessels under 45 feet long shrimp principally in the inside waters of the state as they are too small to shrimp in the outside waters. The vessels over 45 feet long shrimp both in the inside and outside waters.

There is a closed season on shrimp in the inside waters of the state from February 15th through April 15th, and from June 21st to the second Monday in August of each year. There is no closed season in outside waters.

TABLE NO. 11

BARRELS OF VARIOUS TYPES OF PROCESSED SHRIMP MARKETED DURING THE PAST SIX YEARS AND VALUE TO THE PRODUCER

	BARRELS (210 lbs.)								
	1946	1947	1948	1949	1950	1951	Average per year	%	Value 1951
Whole & Canned	207,296.8	148,915.9	135,815.7	139,870.5	126,541.2	125,166.3	147,268	38%	$ 3,755,000.00
Headless	199,591.0	180,262.3	169,881.6	147,431.7	143,731.3	203,461.5	174,060	44%	13,225,000.00
Dried	47,879.3	23,787	49,189.4	52,618.2	48,530.2	38,639.3	43,441.	11%	463,500.00
Cooked & Peeled	10,213.8	12,652.2	21,718.6	36,199.8	42,562.5	29,712.5	25,497	7%	1,040,000.00
TOTAL	464,980.9	365,617.4	376,605.3	376,039.7	361,365.2	396,979.6	390,265	100%	$18,483,500.00
Tons of Shrimp Meal	670.3	333.0	688.7	736.6	727	580	747		$43,500.00

Table No. 11 lists various types of processed shrimp marketed during the past five years and value of same to producer in 1951.

TABLE NO. 12

MONTHLY AVERAGE SHRIMP PRODUCTION SIX YEARS, 1941-1946, AND FIVE YEARS, 1947-1951

MONTH	6 Year Monthly Barrel Average 1941-1946	Per Cent	5 Year Monthly Barrel Average 1947-1951	Per Cent
January	52,312	10%	18,167	5%
February	34,691	7%	14,436	3%
March	19,001	4%	13,193	3%
April	12,591	3%	17,812	5%
May	21,985	4%	36,223	10%
June	37,996	8%	26,440	7%
July	29,907	6%	9,161	2%
August	19,603	4%	47,481	13%
September ...	60,210	12%	48,133	13%
October	66,999	13%	62,591	17%
November ...	74,775	15%	46,237	12%
December	68,312	14%	35,448	9%
TOTAL ..	498,832 Bbls.	100%	375,322 Bbls.	100%

TABLE NO. 13

PRODUCTION OF DRIED SHRIMP BY MONTHS FOR CALENDAR YEARS 1950 AND 1951

Month	1950	Per Cent	1951	Per Cent	Yearly Average	Per Cent
January	2,579	5%	2,904	7%	2,742	6%
February	2,665	5%	1,809	5%	2,187	5%
March	847	2%	410	1%	629	1%
April	1,260	3%	.....	...	630	1%
May	3,272	7%	201	1%	1,737	4%
June	3,792	8%	846	2%	2,319	5%
July	.....	...	75	...	38	...
August	1,966	4%	3,823	10%	2,897	7%
September	2,151	4%	4,177	11%	3,164	8%
October	8,545	18%	8,892	23%	8,719	20%
November	10,686	22%	10,134	26%	10,410	24%
December	10,869	22%	5,365	14%	8,117	19%
TOTALS ..	48,530 Bbls.	100%	38,639 Bbls.	100%	43,587	100%
Shrimp Meal	727 Tons		580 Tons			

TABLE NO. 14
MENHADEN FISHERIES PRODUCTION FOR YEAR 1950

State	No. of Plants	Total Lbs. of Fish	Value Dry Scrap & Meal	Value Oil	No. of Boats Operating in La. Waters
Mississippi	4	69,549,350	$ 967,424.00	$ 567,783.00	18
So. Carolina and Texas	2	48,152,230	537,601.00	337,076.00	4
Louisiana	4	207,754,940	2,778,751.00	1,520,392.00	24
TOTAL	10	325,456,520	$4,283,776.00	$2,425,251.00	46

Total Value of Meal, Dry Scrap and Oil $6,709,027.00

It is estimated that 80% of the Menhaden brought to Mississippi for processing are taken from Louisiana waters.
Value dry scrap, meal and oil $1,228,165.00

Estimated 50% Menhaden processed in Texas are from Louisiana water. Value 437,338.00

Add total Louisiana production 4,299,143.00

Total Number of Pounds from Louisiana Waters....287,470,535
Value $5,954,646.00

Revenue derived from this industry for the year 1950—46 Netting Licenses @ $25.00 each .... $ 1,150.00

TABLE NO. 15
SHRIMP PRODUCTION FOR FIVE GULF STATES AND MEXICO FOR YEAR 1950

State	Number Barrels Production (210#)
Florida	64,641
Texas	202,394
Alabama	17,354
Mississippi	39,046
TOTAL	323,435
Mexico	222,939
	546,374
Louisiana	361,366
	907,740

Louisiana production equals 53% of the total catch for five Gulf states.

Louisiana produces 40% of the shrimp caught in the five Gulf states and Mexico.

During the early part of 1951 suit was entered by Mississippi and Alabama fishermen in the U. S. District Court, Eastern District of Louisiana, New Orleans Division, Civil Action #3055.

DOMINIC GASPODONOVICH, *ET ALS.*
VS.
ERNEST S. CLEMENTS

Briefly these Mississippi and Alabama fishermen brought action to permit them to shrimp in Louisiana waters in equality with Louisiana fishermen.

The above court ruled against this state and enjoined this state from prohibiting out of state vessels and non-resident persons in our waters. This case is being appealed to the U. S. Supreme Court, however in the interim these out of state vessels and persons are fishing in our waters. We cannot bar them from our waters as we have always done. Our laws do not even provide for a license fee. They are taking our shrimp from our waters without a license fee or payment of tax and transporting them to their states.

TABLE NO. 16

NUMBER OF ANGLING LICENSES SOLD SEASON 1939 TO 1950 INCLUSIVE

Year	Total	Angling Resident $1.00	Angling Non-Resident $5.00	Angling Non-Resident 7 Day Trip $2.00
1939	27,096	12,649	14,447	** ....
1940	31,014	16,140	14,874	** ....
1941	52,695	38,080	*14,615	....
1942	41,661	30,608	*11,053	....
1943	36,112	29,492	3,332	3,288
1944	33,239	25,755	3,743	3,741
1945	35,002	27,000	4,088	3,914
1946	52,909	42,621	5,808	4,480
1947	64,055	59,353	4,702	** ....
1948	66,797	63,657	3,140	** ....
1949	82,942	72,397	5,970	4,575
1950	83,068	72,044	5,872	5,152

* Includes both Annual and 7-day trip.

** No 7-day trip license issued during these years.

Table No. 16 lists the number of angling licenses sold yearly from 1939 through 1950. It will be noted that there has been an increase in angling licenses sold, comparing 1939 with 1950, of 55,972 licenses and from 1947 to 1951 an increase of 19,013 licenses.

Only resident persons fishing with rod and reel or artificial bait are required to have a license. No person over 60 or under 15 years of age, or person in the armed services of the United States, regardless of residence or domicile, is required to take out an angling license.

Louisiana, in comparison with other states in the union, is close to the bottom of the list in number of angling licenses sold annually, not because of a smaller number of fishermen but because fish being one of the most, if not THE most, common foods available to Louisiana residents, the state wants every resident person to use and utilize this product so necessary to their existence, without the payment of a fee.

Louisiana and California are the only two states in the union that require an angler's license in salt water for rod and reel or artificial bait, only. Other types of resident fishermen that fish with other tackle and for their own consumption, not for sale or exchange, are not required to take out a license. The law requiring a license for salt-water anglers has been in effect for many years. I have found nothing printed stating why Louisiana should be different from other states in the passing of this law; however, in all probability it was taken into consideration when this law was passed, that this state, with few exceptions, differs from any other state in the union, for the following reasons:

1. Louisiana has 950 miles of coast line, including bayous, inlets and bays, that are actually in inside waters of the state in addition to the other outside areas within this state.
2. Some of the bays, bayous, and inlets could be either fresh or salt water at times, depending upon the tide. It would be difficult to determine whether an angler was in salt, fresh or brackish water. The Mississippi River is very often brackish up to New Orleans, 100 miles from the Gulf, and it would be difficult for an enforcement agent to determine the kind of water in any stream, bayou or lake in the coastal parishes.
3. The great majority of our angling licenses are sold in other than coastal parishes, many of these anglers own a rod and reel costing only a few dollars. A salt-water angler owns tackle worth ten times as much as the fresh water fisherman, in addition to owning a boat or paying rental for a boat. Why should the fresh-water fisherman pay a license in order to defray the expense of enforcement, protection, and propagation of fish and the salt-water fisherman be exempt? The cost of enforcement for salt-water fishing, considering the use of planes, patrol boats, etc., is much higher than that in fresh water.

4. It is inconceivable that a resident salt-water sport fisherman, with his greater investment in tackle, boats, outboard motors, who is able to fish at any time in the year, and catch a greater number and variety of fish, would object to paying $1.00 per year to angle in both salt and fresh water throughout the state.

5. It is true that at times anglers will go outside of Louisiana waters, which would be international waters; however, but how would an enforcement agent determine if they were outside of Louisiana waters unless he followed each boat of anglers.

6. It is argued that to charge a non-resident to fish in both salt or fresh water $2.00 for 7 days, or $5.00 for 365 days in the year would drive away tourist trade because their states do not charge for a salt water license. In my opinion a sport fisherman spending the amount of money to travel to this state surely would not be influenced by a $2.00 license charge considering the fact that Louisiana has more to offer than any other state in the union in fresh and salt-water fishing. It is a fact that in Louisiana you have fishing the year around, and that at any time in the year you cannot fail to get some type of edible fish. A licensed person may catch and take home a legal creel limit as follows:

   Fresh Water Fish—Small Mouth Bass, Green Trout, Yellow or Striped Bass, White Bass or Barfish, Crappie or White Perch, Speckled Perch or Sac-A-Lait, various species of Sunfishes, Perch, Bream, Crawfish, Frogs, Turtles and other species of game and all commercial fish.

   Salt-Water Fish—Commercial Fish, including Channel Bass or Redfish, Speckled Trout, White Trout, Silver Trout, Sheepshead, Tarpon, Jackfish, Mackerel of all types, Sailfish, Wahoo, Bonita, Barracuda, Bluefish, Dolphin, Crabs, Shrimp and many other types of salt-water fish too numerous to mention.

Compare this with any other state in the union. Boats are available for charter to go wherever desired. Surf casting from our islands, especially Grand Isle, is excellent.

The answer as to license requirements for salt-water sport fishermen in the nine coastal parishes is not a free license. Sport fishermen, salt or fresh water, are exactly what the name implies, "sportsmen." They want no handouts and are more than willing to pay their way. Any salt-water sport fisherman, to my knowledge, would consider it an insult if someone suggested a donation of a free license at the expense of a fresh-water sport fisherman who pays his license fee in the fifty-six other parishes.

During the past few years a great part of the increase in license sales was due to collecting salt-water sport angling licenses through education and enforcement. Much remains to be done through education and stricter enforcment of angling license laws in salt water. Licenses are for sale at every sheriff's office, sporting goods houses, department stores, or whenever you board a boat, and hundreds of other places. Charter boats should call attention to license requirements, not to force the sale of a license, but to point out that they may be embarrassed by state agents checking for the licenses. Angling license sales in the state will increase by at least 20% if agents continue to enforce the law in all localities. It can be done without embarrassment or hard feeling to the salt-water sport anglers.

TABLE NO. 17

ANGLING REVENUES—FISCAL YEARS

1935-36	$ 10,451.41
1936-37	17,807.75
1937-38	25,918.28
1938-39	27,179.57
1939-40	26,436.28
1940-41	47,454.01
1942-43	53,203.28
1944-45	48,398.47
1946-47	89,014.64
1948-49	92,299.32
1949-50	104,548.43
1950-51	107,771.72

Table No. 17 cites the revenues derived from the sale of angling licenses during the fiscal years 1935-36 to 1950-51 inclusive.

There has been an increase in revenues when comparing fiscal year 1935-37 with 1950-51 of $97,320.31, also 1946-47 with 1950-51, of $18,757.08.

The above increase is not due so much to the increase in population of this state but to the fact that every year finds more fishermen using rods and reels than in former years, and more and more women taking up the sport. Fishermen have been educated and are now using sport tackle where in prior years they were statisfied to use pole and line, hand lines, etc. Today a smaller catch made with a rod and reel will give greater satisfaction and more pleasure than a much large one using the old method. Education and publicity, strict enforcement of laws, with stiff penalties as to licenses, size, closed waters, creel limits, etc., are necessary.

TABLE NO. 18

NUMBER OF HUNTING LICENSES SOLD SEASON 1939-40 TO 1950-51 INC.

Year	Total	Hunting Resident $1.00	Hunting Non-Resident $25.00	Hunting Non-Resident 4 day Trip $5.00
1939-40	98,167	93,587	1,335	3,245
1940-41	116,653	115,336	166	1,151
1941-42	146,648	144,349	495	1,804
1942-43	119,543	118,300	163	1,080
1943-44	94,609	93,334	181	1,094
1944-45	124,485	121,767	407	2,311
1945-46	162,872	160,795	409	1,681
1946-47	170,396	169,652	744	* ....
1947-48	176,715	175,482	1,233	* ....
1948-49	222,201	221,702	499	* ....
1949-50	235,447	234,964	483	1,140
1950-51	235,472	234,195	137	1,140

* No 4-day trip licenses issued during those years.

Table No. 18 gives the number of hunting licenses sold during the fiscal years 1939-40 through 1950-51.

The increase in hunting licenses comparing 1939-40 with 1950-51 is 137,005, comparing 1946-47 wth 1950-51 total 65,076.

The increase in the sale of hunting licenses is due to these various reasons:

1. Because many of our young men who were in World War II became acquainted with firearms, and when the war ended they became interested in game hunting.

2. Education and publicity to stress the importance of sportsmanship and importance of conservation.

3. Stricter enforcement of laws.

4. Revived interest in hunting because of a program of restocking of game and opening of new game preserves.

5. Reasonable license fees and seasons to permit the taking of all types of game anywhere within the state, either small or large, by resident and non-resident persons on the same license.

6. A greater number of women now hunting.

Considering the fact that today we have over two and one-half times the number of hunters that we had 12 years ago, hunting in the same area, we realize the necessity for strict enforcement of laws, heavier penalties for violations, education, continued restocking of game, etc., to allow for the increased pressure.

TABLE NO. 19

HUNTING LICENSES REVENUES

1935-36	$ 42,797.35
1936-37	68,185.57
1937-38	71,305.13
1938-39	90,555.38
1939-40	96,717.43
1940-41	115,941.28
1941-42	144,767.29
1942-43	129,113.56
1944-45	124,690.62
1946-47	*334,970.17
1948-49	*220,435.11
1949-50	231,719.86
1950-51	226,543.77

*Hunting licenses $2.00 during these years in place of $1.00

Table No. 19 is the revenue from hunting licenses during fiscal years 1935-36 through 1950-51.

The increase in revenue to the Department from 1935-36 to 1950-51 amounts to $183,746.42.

The increase from 1946-47 (taking into consideration that the resident license fee was $2.00 instead of $1.00 as today) compared with 1950-51 was approximately $165,318.17.

Reason for increase is the same as outlined after Table No. 18.

TABLE NO. 20

RECAPITULATION OF REVENUES AND VALUE TO PRODUCER FROM COMMERCIAL FISHING AND SHRIMPING INDUSTRY, FISCAL YEAR 1950-1951

COMMERCIAL FISHING AND SHRIMPING

Source	License	Severance Tax	Approximate Value To Produce
Dealers—Fish and Shrimp	$30,140.00	....	....
Fresh Water Netting	22,565.00	....	$ 3,348,649.58
Salt Water Netting	1,815.00	....	1,607,627.95
Menhaden	1,150.00	....	5,954,646.00
Shrimping	42,272.00	$64,986.50	18,527,000.00
TOTAL	$97,942.00	$64,986.50	$29,438,023.53
*Revenue from Shell 1951		98,217.12	
		$163,203.62	
TOTAL LICENSE AND TAX		$261,145.62	

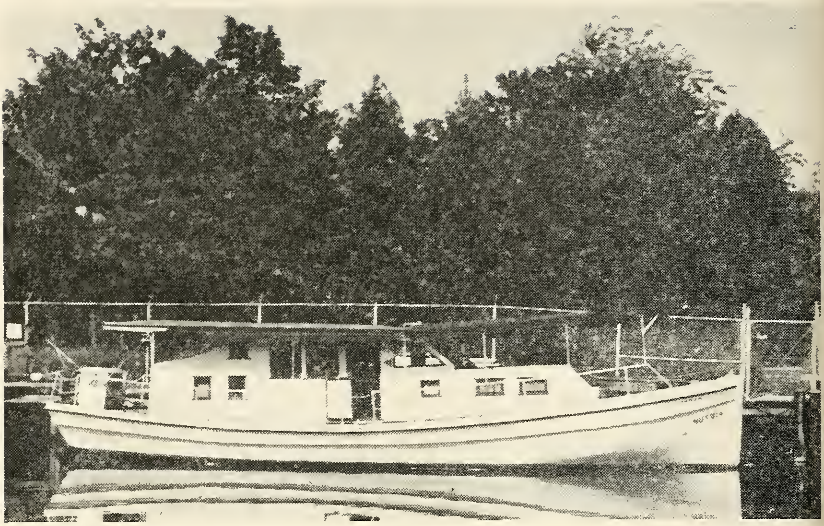
* Year 1951. This revenue is additional tax put on shell by the last legislative session for development of commercial shrimping and fishing industry.

Estimate value to producer	$ 29,400,000.00
Payroll value to producers' helpers, their dependents, wholly or partially dependent upon this industry	100,000.00
Estimate investment in vessels and equipment	30,500,000.00
Estimate investment in netting, skiffs, trucks, etc.	5,000,000.00
Estimate value in shops, plants, equipment, labor	45,000,000.00
TOTAL VALUE OF INDUSTRY TO STATE OF LOUISIANA	$110,000,000.00
The above revenues and valuations do not include commercial operations such as oysters, sand, gravel, shell, fur licenses, fur taxes, trapping, etc., which are taken up in other parts of this Biennial. The revenues from these sources amount to	$ 277,785.76
TOTAL COMMERCIAL REVENUE	$ 538,931.38

SPORT FISHING AND HUNTING—REVENUE AND VALUATION

Source	Amount Collected 1950-51 License Fees	Estimate Value of Equipment
Hunting	$226,543.77	$45,500,000.00*
Angling	107,771.72	7,500,000.00*
TOTAL	$334,315.49	$53,000,000.00

* The above valuation is estimated on basis that the average sport fisherman's investment in tackle, boats, outboard motors amount to $75.00 each. For hunters, shells used, guns, boats, decoys, dogs, outboard motors at $150.00 each.



The patrol boat "Nutria"

Load of fish traps confiscated by game wardens in the Amite River.

ENFORCEMENT DIVISION REPORT

Paul A. Voiter, *Director*

Paul Voitier

THIS report of the Enforcement Division covers the period beginning January 1, 1950, and ending December 31, 1951.

Functions of the Division are the enforcement of all laws protecting the wildlife, seafood and fur bearing resources of the State of Louisiana.

Enforcement of any law is a thankless task and although all laws are made for the protection and preservation of a country's people and their resources, the people themselves are the greatest complainers. Especially is this true with the enforcement of fish and game laws. Unfortunately the taking of fish and game is looked upon by many as their God-given right. It is amazing how few realize that all fish and game is the property of the state and consequently the property of the residents of the state. Hence, game law violators are robbing themselves as well as everyone else when they take fish and game illegally.

Although great strides have been made in law enforcement n Louisiana during recent years, this activity is one that needs onstant application and above all the assistance of the general ublic. It requires the diligent effort of many hundreds of poicemen to properly enforce law in a city the size of New Orleans, yet even a smooth working, capable policeman department cannot prevent law violation. Consider then the fact that a comparative handful of game wardens are entrusted with law enforcement of our entire state. The constantly increasing tota of game law violators brought to book is proof that law enforcement is progressing. By the same rule, this total is also proo of game law violations still thriving. This is positive indicatio that without the aid of the general public no law enforcemen program under the manpower restrictions now imposed can b entirely successful.

The law Enforcement Division of the Louisiana Departmen of Wild Life and Fisheries has been developed into a stream lined operation that is comparable to that of any other state i the union. Better boats, automobiles, airplanes and radio com munications, are now being used with excellent results. Espe cially is this true of the recently installed radio department o the Enforcement Division. It is now possible for enforcemen officers on patrol boats to communicate with patrol planes, aut mobiles, and the department headquarters at all times to rela information or receive instructions as to the location and activ ties of fish and game violations. The violators themselves hav become more wary because of these new enforcement poss bilities.

It has been unfortunate that some of the Justices of th Peace and District Judges have not been imbued with the dete mination that no violator be permitted to go unpunished. Thu making it more difficult to instill a needed fear of the law in the hearts of the violators.

Shrimp season regulations are imposed solely for the prote tion of shrimp during spawning time, and the protection of new spawned crustaceans. This protection affords an equal guarant to men and women, who get their living from the shrimp i dustry, that they will continue to have a profitable avocatio It is sad to realize that some shrimpers care less for regulatio that protect their industry than they do for the future of t marketable production they seek, and by their law violatio destroy ten times or a hundred times the number of shri they take. This same thing holds true with all of our fish a game.

This Department is a state agency charged with the responsibility of conserving our fisheries industry and our sports fish and game, not only for the present generation, but so that future generations may enjoy their abundance. If the individual sportsman or resident condones and encourages the fish and game law violations of his acquaintances, he makes the task of the Enforcement Division of this Department exceedingly difficult. If every person would report all fish and game law violations the same as they would report a home or store burglary there would be a sudden drop in these depredations and there would also be an ncrease in the state's wildlife resources. There would also be a great reduction in the complaints from every area in the state now received by this Department.

The Enforcement Division is subdivided into three sections, namely: Director's Office, Waterways Section, and Inland Section. Each section has its particular duties to perform.

DIRECTOR'S OFFICE

The Director's Office supervises and coordinates the activities f both Waterways and Inland Sections, and maintains all ecords of the personnel, equipment field activities, court cases nd dispositions of same. It also maintains public relations with ndividuals or associations interested in the protection of wildfe resources of the state. It inspects all processing plants of he commercial distributors of our seafoods and the refrigeraion and storage space of all bird, waterfowl, game and seafood esources of the state.

WATERWAYS SECTION

One of the smaller yet very important cogs of the Enforcement Division is the Wild Life and Fisheries Wharf located at 612 West End Boulevard, which is charged with, and directly esponsible for maintenance on the numerous patrol boats, outboard motors, hulls and other equipment owned by the Department. Here is maintained a complete machine shop, outboard otor shop, carpenters' shop, and the short wave radio station hich keeps the Department in constant contact with all patrol boats, planes, mobile units, camps and main office.

In February, 1950, the location we now have was purchased a cost of $36,500, which included the main building and a ten-ton crane (original cost $8,500), plus three hundred feet of wharf where patrol boats are moored for repairs. It was necessary to move from our old location on the New Basin Canal, just below Metairie Road, as the anticipated Terminal Station required the basin be filled to the Black Bridge. This new location at the end of the New Basin Canal, and just a few minutes from Lake Pontchartrain, saves over an hour of travel that was necessary during the old set-up and greatly shortens the time necessary for rescue work in Lake Pontchartrain which we are constantly called upon to perform.

Since the purchase of this new location, numerous changes and improvements have been made, all of which was done by the employees of this Department at a considerable saving to the state, including a large carpenter's shop with shed attached, in order that patrol boats may be lifted on to a marine dolly and rolled out of the weather so that rain, heat or cold does not interfere with the workmen, and maintenance can go on regardless.

Enforcement Director Paul Voitier (right) and assistant director, Juliu Book, with confiscated guns and wild ducks taken from a game hog.

It was even found possible to convert what had formerly been a store-room on the second floor of the new wharf building into a modern, comfortable and clean dormitory, which is now being used by the Department employees from all parts of the state who visit New Orleans periodically in the transaction of their normal business, again saving the state money that would normally be charged to hotel expense by these visitors.

We have at the present time a staff of carpenters, machinists and painters who make it unnecessary for the majority of our boats to require the service of a shipyard, thereby saving the taxpayers the added expense of docking demurrage, repairs and other items.

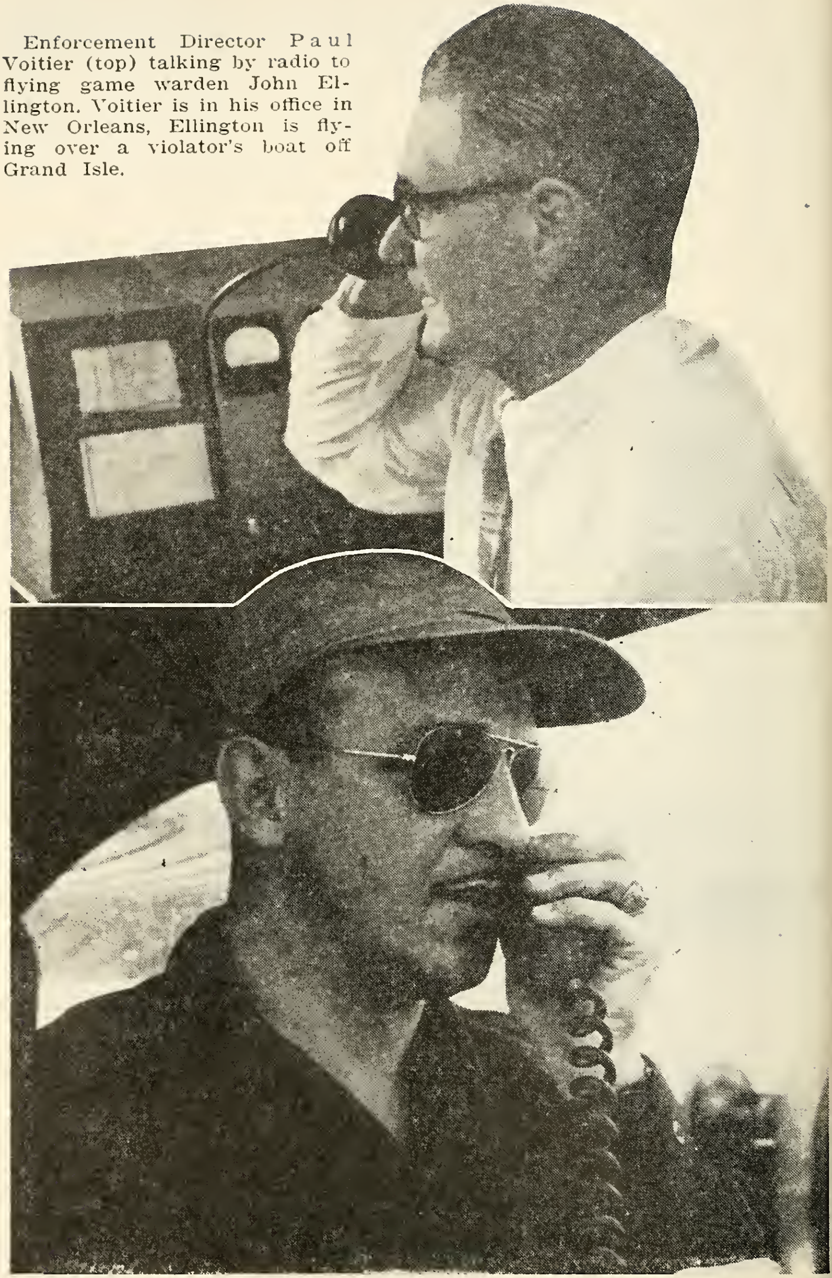
At this time, we are in the process of putting more than 1500 cubic yards of rip-rap (concrete slabs), 1800 square yards of asphalt, and an eight square yard concrete apron, plus numerous pilings, around and under the wharf which will greatly strengthen and improve this unit so that greater loads can safely be handled in the future.

A complete renovation of the Enforcement Division's fleet of large and small boats which is maintained for law enforcement patrolling duty, as well as the purchase of high powered outboard motors, has been in progress.

Some boats, that were considered antiquated, dangerous and beyond repair were junked. A new patrol boat, the "Zoric" was purchased and put into service. The old "Tarpon," found to have a hull in splendid condition, was stripped to the ribs and completely rebuilt and is just now ready to go into service as one of the finest boats of its kind in all Louisiana waters. Dozens of other smaller boats have been overhauled and repaired and are now in splendid condition. The great majority of all of this restoration work has been done by workmen at our own wharf at a great saving in repair cost.

It was found possible to buy high powered outboard motors at a saving of approximately $150.00 each, from wholesale dealers instead of patronizing the dealers who had been supplying this type of equipment in the past. In similar manner, other economies were effected and the marine equipment of the Department was restored to an A-1 condition.

It was also found that one of the more prominent boats in the patrol fleet of the Enforcement Division did not belong to



Enforcement Director Paul Voitier (top) talking by radio to flying game warden John Ellington. Voitier is in his office in New Orleans, Ellington is flying over a violator's boat off Grand Isle.

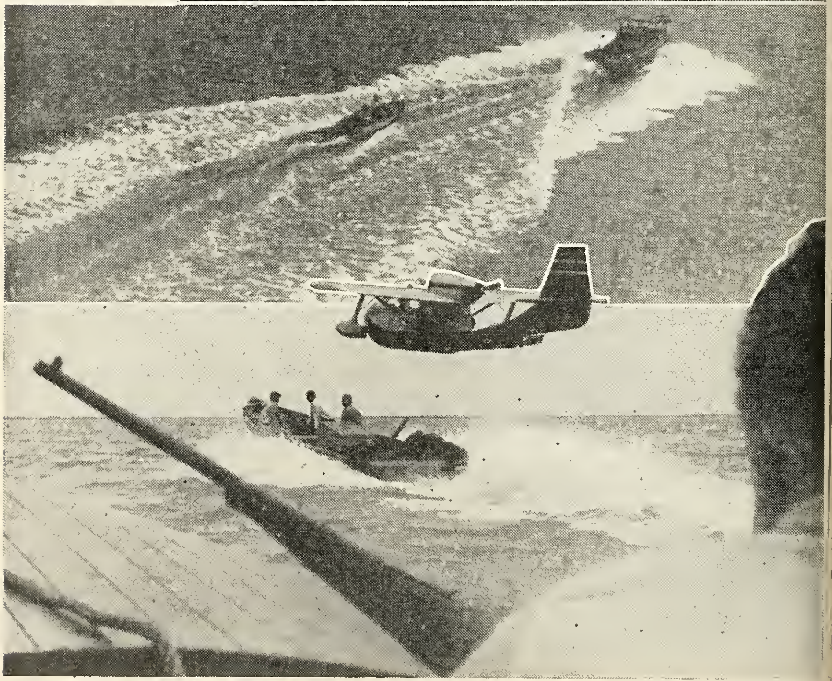
the Department of Wild Life and Fisheries, although it had been in use by this agency for many years. This boat known as the "Black Mallard," was seized a great many years ago by prohibition agents when it was found to be transporting a load of, then, illegal liquor in Louisiana waters. Soon after its seizure it was loaned to the Department of Wild Life and Fisheries to be used in a biological shrimp survey, and since that time has been one serviceable unit of the Enforcement Division. During the course of scrutiny given every boat in our fleet, it was revealed that the U. S. Government still retained title to the "Black Mallard" although considerable sums of money had been spent from time to time by this Department in its repair and maintenance. Steps were immediately taken to have Congress enact a bill giving the Department of Wild Life and Fisheries of Louisiana correct title to the "Black Mallard" and the bill was eventually signed by the President, thus adding another valuable unit to the Enforcement Division's assets.

In conjunction with the restoration of the Department's boat and wharf facilities and as a furtherance of our law enforcement program, a short wave radio installation has been completed and is maintained at the wharf. Now all the major units of the patrol fleet are in constant touch with the wharf, the office of the Enforcement Director, as well as each of our fleet of four airplanes, and several of the Department's automobiles used by our enforcement agents.

Only recently has this radio installation been entirely completed so that now all mobile units of the Enforcement Division, as well as the headquarters for the Division, are in constant and direct communication with each other. Even the automobile used by the Commissioner now carries a radio hookup so that the Commissioner, no matter where he may be, can get in instant contact with the office, any Department boat, airplane, automobile or the boat wharf, thus facilitating the administration of the entire Department's affairs, as well as stepping up the activities of the Enforcement Division immeasurably.

What effect this will have in the actual enforcement work can readily be seen. If the Enforcement Director gets a tip-off on some fish or game violations while in his office, he can immediately contact the enforcement agent nearest the spot of the violation, and in a matter of minutes the transgressor may be

Illegal shrimp trawler cuts trawl loose as game wardens in airplane and speed boat approach. (Below) Just before the capture with plane overhead and patrol boat with armed warden coming on.



apprehended. If a boat or airplane on patrol sees a violator the agent is unable to contact, he can, in matter of seconds contact the nearest officer who is able to get to the scene of the violation.

Airplane patrols may spot illegal hunters, notify enforcement officers of their location, and remain in radio contact with the approaching officer until the capture is made. The same applies to every phase of mobile equipment used by the Enforcement Division. Illegal shrimp trawlers, oyster dredgers, fish violators and even illegal trappers are brought to an almost certain capture by this new radio hookup, where in the past they have been able to elude game wardens and enforcement agents. The speedy boats of such violators, which have been used in the past to outstrip pursuing agents in bayous, open lakes and lagoons, now will avail the culprits nothing. They can't outrun an airplane or an automobile, and if they are detected in their depredations, they may expect almost certain arrest, instead of the security they formerly enjoyed because it was so easy to evade law enforcement.

By use of the new radio hookup the Enforcement Director is now in constant touch with all his enforcement officers, where heretofore he had to wait until they reported in, or were located at some wharf by messenger. And through the same medium every agent is within instant reach of headquarters should he desire instructions or to impart information.

With this Department's constantly expanding conservation activities the new radio department adds an enforcement possibility that should strike fear into the heart of every potential violator. Even the air he breathes now is loaded with a warning for him to consider the consequences, for any violator is subject to radio detection, and detection now will mean almost certain capture. You can't outrun, or hide from the air around you.

INLAND SECTION

The Inland Section is composed of the Wild Life Enforcement Agents assigned to the various parishes and the rangers who operate over the entire state.

This section is charged with law enforcement of all inland lakes, streams and woodland, and is divided into the eight congressional districts. There are supervisors in charge of various districts in the state, each of whom is responsible for the activities of the agents in his particular district. The rangers operate under the direct supervision of the Director's Office, functioning wherever necessary in any and all parts of the state, and assisting the district supervisors in any way necessary.

Due to the rapid increase of the processing and distributing of our seafood resources, this Division has expanded considerably. In order to properly inspect and supervise this branch of our enforcement work, equipment has been greatly increased. The operations of this Division have increased in order to keep pace with the exceptionally large increase in hunting and fishing as a mean of necessary recreation throughout this state.

Because of the natural obstacles that constantly harass game wardens in Louisiana, law enforcement becomes an extremely difficult problem in this state. First of all is the tricky, wily maneuverings of the violator to avoid being overcome. Subterfuges, camouflage, secret prowlings, wilful misinterpretations, all add their share of deception for the escape of the culprit, but these are more or less standard methods of fish and game violators everywhere. Here in Louisiana all the regular gimmicks used to evade the law, are enhanced by the unusual terrain of the state. With so much marshland, almost virgin jungle, dense forests, and countless bayous, lagoons, lakes and rivers, the violator has, for years, led game wardens a merry chase, and too often laughed up his sleeve at the fruitless efforts of the enforcement officer to apprehend him.

The best trained and most sincere game warden in the world is at a great disadvantage in ferreting out a law breaker who knows the marshes, reefs, myriads of bayous and dense jungle, as he knows the palm of his hand. Risking life and limb has been a general, rather than an unusual, practice among the wardens in their attempts to overhaul culprits.

Some people complain about game and fish laws; some people complain that there is not more complete enforcement of game and fish laws. What pleases some, irks others, and it all adds up to headaches, and more headaches, for the Enforcement Division. Game wardens and rangers spend their spare time, if any, trying to devise new ways to entrap the law violators, and they have come up with some pretty nifty methods.

On the other hand it seems that ingenuity is not something that is alotted to the game warden alone. The violator proves, and has been proving through the decades, that he can think up new wrinkles, too, and each new scheme, trick or what have you, means just that many more headaches for the Enforcement Officer.

But now the headaches have descended on the Enforcement Division in an avalanche . . . an avalanche of electricity. Believe it or not, the violators are now electrocuting their fish, and they are rapidly becoming so brazen in their depredations that it seemed they must have declared war on law enforcement.

Atomic bombs could do no more to rid Louisiana's streams, bayous and lakes of game fish, than these "electrifiers" were planning to do, and the first ones caught insisted they were within the law.

Just because "shocking fish with an electric current" was not mentioned by that description in the Louisiana fish laws did not mean that the method was legal. It is wholly and strictly illegal. And the laws say so, because the laws specifically point out the legal means of taking any kind of fish and plainly say all other methods are illegal. And of course "electrocuting" fish is illegal.

When the electrocution of fish continued to be a serious menace, a new law was immediately prepared and introduced and passed by the Legislature of the State of Louisiana at the Extraordinary Session begun and held June 19, 1951, approved by the Governor, relative to the method of taking commercial fish, by prohibiting additional illegal methods of taking these fish; and, relative to penalties, by providing fines and mandatory jail sentences for convictions of this violation.

When the fines for violations began to fall, the suddenly spawned desire to fish with electricity also began to weaken, but it took immediate action and determination to dampen the ardor of the "shock" fishermen.

The use of electricity to momentarily shock fish is not new. It has been practiced for years by the U. S. Fish and Wild Life Service to take a fish census in some parts of the country. The shocked fish come to the surface, apparently lifeless for a minute or so, and then slowly revive and swim away with no harm being done them permanently. While they are on top of the water it is possible to count noses, as it were, and establish the fish population of various streams, as well as the kind of fish predominating in these streams.

But the temptation was too great for the game and fish hog. There's no telling when or where the first violations took place, or what kind of a contrivance was used, but the scourge hit Louisiana, in the Pearl River area first, it seems, and had started to spread throughout the state. It has been somewhat checked by now, and it is hoped that when sportsmen and their friends realize the damage that can be done to their fishing sport, they will join with the enforcement officers in helping to apprehend all violators.

In many instances no more complicated contrivance was used than an outboard motor and a length of extension cord. The

Fish and electrial equipment confiscated when enforcement agents captured fish electrocutors in Pearl River. Left to right in the picture are: Salmon Crawford, Paul Voitier, director; Julius Book, assistant director; and Adolph Craddock.

motor generates the current, the wire carried it into the water and a small area was shocked. Others used the old fashioned battery type telephone box with which they could generate an electric shock by turning the crank. Still others have used storage batteries, magneto boxes and coils, and the many other kinds of mechanism with which to develop enough current to shock various areas of water.

It makes a fast, if not a sporting way to fish. When the current is sent into the water, the fish come up. Some of them are knocked out completely; others thrash around in a dazed condition on top of the water, and the violators merely have to scoop them into their boat. One group of four men took two hundred pounds of fish in this manner in one minute, and in the lot were bass, sac-a-lait, perch, catfish of all kinds, goggle-eyes, etc. Catfish and eels are said to be exceptionally susceptible because they have no scales. On the other hand, garfish are virtually immune unless the shock is extremely heavy. Too, garfish don't come up. They go down, and being air breathers, they drown if the shock is heavy enough to knock them out. This of course is good, but it's the only good in the whole thing.

You can readily see how easy it would be to ruin all the restocking work the Department has done; how quickly our streams and lakes could be entirely denuded of all game fish; how many thousands, perhaps millions of honest fishermen and women would be denied their outdoor recreation because the fish had fallen victim of hoggish violators, who cared nothing for the sport of fishing and only wanted all the fish they could pile into their boat.

Above all it is hoped that the sense of true sportsmanship will prevail so that everyone who owns an outboard motor, or is able to fix up an electrical contrivance of some kind, won't take advantage of the "shock" treatment in their fishing expeditions. It certainly isn't sporting; it IS illegal; more than that, it's a cowardly thing to do merely for the sake of a few fish.

The only tenable solution for better enforcement of our fish and game laws must come through more new laws that will make punishment of violators mandatory. When persistent violators are either dismissed or given ridiculously low fines in our courts, there is little to deter the temptation of game or fish hogs, and when severe penalties, both in fines and jail sentences, become mandatory, the violators will constantly diminish in number, and game wardens will take new heart in their work.

Not all game wardens are perfect enforcement officers, no more than are all policemen or deputy sheriffs, or any other type of law enforcement official, but this Division is constantly striving to do the best job it can. How much better that job could be done depends on the cooperation of the general public, because after all it is the property of the general public we protect.

In addition to the Director's Office, Waterways Section and Inland Section, the following report covers the activities of the Aviation Section in connection with Enforcement:

In this streamlined world, flying game wardens are not exactly a new thing; but, the Louisiana Department of Wild Life and Fisheries is finding its flying wardens extremely valuable in the enforcement of the fish and game laws. And the law violator has found that the approaching drum of an airplane motor is a forerunner of disaster.

In the days before airplanes were put in use by the Enforcement Division of the Wild Life and Fisheries Department, fish and game violators played a merry game of tag with game wardens in the Louisiana bayous and marshes. Knowing the labyrinth of canals, bayous and lagoons as they knew the decks of their own boats, they had little difficulty in dodging the enforcement officer. But they don't dodge the radio equipped planes.

Ducking into shallow bayous or marshes, where the patrol boats of the Enforcement Division can't go, doesn't give them sanctuary, either. A patrol plane pilot can spot the violator, radio his location and direct boat borne officers to him, if necessary. Or, if the water or terrain is suitable for landing, the flying warden can make the arrest himself.

"Flying Squadrons" of game wardens are being employed with excellent results in all parts of the state. These units are sent out from headquarters as special squads wherever violations of a considerable number are reported. Because they are not known in the areas into which they are rushed, they are able to avoid the identification which too many times warns the violator to get under cover, and in a few hours they have been known to entirely clean up communities where illegal hunting and fishing has been reported. The work of these squadrons is increasing daily and the effect is being felt throughout the entire state, with the result that much game and countless fish are being saved from illegal destruction.

The Enforcement Division of the Department of Wild Life and Fisheries now has two Seabees and the use of another Seabee and one Widgeon which is the property of the Oysters and Water Bottoms Division . . . all amphibious planes, for use twenty-four hours a day. And they have three capable young pilots. Two mechanics, employed by the Oyster and Waterbottoms Division, maintain all work necessary on the planes.

Approximately ten per cent (10%) of the total hours flown by the planes are done directly for the public, in performing various services for individuals such as rescue work before and after storm, work done during various floods, numerous searches for lost and drowned persons, searches for lost boats or boats overdue in their home port, assistance given various Federal agencies and also work done for other state agencies.

The following report of arrests will reflect a portion of the activities of the enforcement of the Louisiana laws pertaining to hunting, sport fishing, commercial fishing, shrimp, trapping, fur and hides, etc.:

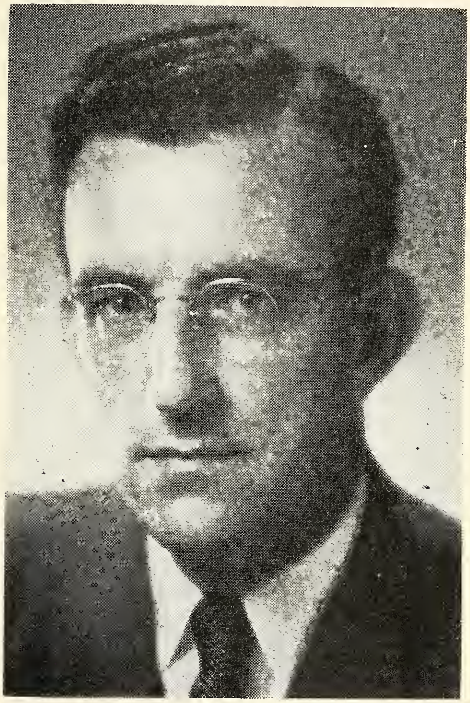
TYPE OF VIOLATION	Total	1950	1951
Angling, No License	101	42	59
Commercial Fishing, No License	18	7	11
Trawling, No License	0	0	0
" At Night	1	1	0
" In Closed Waters	101	62	39
Poss. Undersize Fish	60	31	29
" Over Legal Limit Game Fish	18	6	12
" Game Fish for Sale	11	5	6
" Undersize Shrimp	51	31	20
" Undersize Crabs	13	4	9
" Frogs in Illegal manners	11	11	0
Fishing Game Fish Illegal Tackle	148	64	84
" Com. " " "	54	37	17

TYPE OF VIOLATION	Total	1950	1951
Hunting Without License	71	48	23
" At Night	316	172	144
" with Unplugged Gun	23	18	5
" Quail Closed Season	17	14	3
" Squirrels Closed Season	267	162	105
" Doe Closed Season	67	39	28
" Deer At Night	129	73	56
" Frogs Closed Season	80	31	49
" Rabbits Closed Season	47	34	13
" Turkeys Closed Season	17	6	11
" Doves Closed Season	40	26	14
" Mig. Water Fowl Closed Saeson	72	61	11
" Mig. Water Coots	3	0	3
" No Fed. Stamp	8	2	6
" Snipe in Closed Season	0	0	0
" Grobeck in Closed Season	5	5	0
" Egrets in Closed Season	0	0	0
" Blue Heron in Closed Season	1	1	0
" Fur Bearing Animal with Gun	94	58	36
" from Power Boat	19	2	17
" Woodcock in Closed Season	5	0	5
" Robins in Closed Season	13	3	10
" Frogs with Gun	7	2	5
Camping without License	5	0	5
Trapping, No License	5	3	2
" Out Season	10	6	4
" On State Preserve	11	11	0
" On Rat Bed	0	0	0
Buying Fur, No License	1	1	0
" Illegal Fur	2	2	0
Poisoning Fish	6	0	6
Killing Fish At Night	4	4	0
Fishing with Explosives	7	4	3
" On State Preserve	2	0	2
Pollution of Stream	1	0	1
Over Limit Mig. Water Fowl	26	12	14
Hunting on State Preserve	20	20	0
Poss. of Deer Meat	3	3	0
Poss. of Mig. W. Fowls out of Season	9	9	0
Selling Fish without License	1	1	0
Hunting Mig. W. Fowls Illegal Hours	110	57	53
Electrocution of Fish	44	10	34
Dredging Oysters in Closed Waters	2	2	0
TOTAL	2,157	1,196	961

Cases turned over to the Federal Government for prosecution totaled 167.

DIVISION OF RESEARCH AND STATISTICS

FRANK COOGAN, *Director*


Frank Coogan

CARRYING out the policy established by administrative heads of the Department of Wild Life and Fisheries for many years, the activities of the Division of Research and Statistics have been confined almost exclusively to the abatement of stream pollution in the State of Louisiana.

In order to make clear the steps that can be taken by the members of the Department of Wild Life and Fisheries to promote the abatement of stream pollution, the various administrative means are set forth below by which these steps can be augmented.

The first set of personnel involved in pollution abatement are waste disposal inspectors, employees of the Department of Wild Life and Fisheries. These waste disposal inspectors are semi-professional in classification and are capable of performing various chemical tests out in the field as well as in the laboratory at Baton Rouge. The duties of these agents or inspectors are varied and consist of continued inspection of the sources of industrial waste in the areas to which the inspectors are assigned and the continuous checking of the effects of discharge of these industrial wastes on the receiving water bodies.

In cases where the discharge of industrial wastes are clear violations of the laws of the State of Louisiana in general or laws having to do with the Department of Wild Life and Fisheries in particular, the waste disposal inspector files the charges alleging the violation of the acts in the district court having jurisdiction and continues to press the charges until such time as the cases are brought before the court. In instances where cases are somewhat complicated by the necessity of having the professional opinions given by engineers or biologists, the waste disposal inspector concerned makes as many test as he possibly can on the receiving water body, takes an adequate sample of the waste or wastes being discharged into the water body and calls into the main office at Baton Rouge for the technical personnel necessary to arrive at a proper conclusion regarding the effects of discharge of the waste involved in the case.

The second set of personnel involved in pollution abatement in the State of Louisiana are those personnel that are employed directly by the Stream Control Commission. These personnel, who are engineers and biologists, are located in the main laboratory of the Department of Wild Life and Fisheries in Baton Rouge and are under the administrative control of the head of the Division of Research and Statistics. The work carried by the scientists and engineers are work assignments made by the Stream Control Commission, of which the commissioner of the Department of Wild Life and Fisheries is chairman. In the ordinary course of events, the technicians of the Stream Control Commission are not concerned with routine day-by-day enforcement of the antipollution laws. However, in cases where the Stream Control Commission rules or orders are violated, it becomes necessary for Stream Control Commission personnel to make the necessary observations that the establishment of the violations of these orders might be satisfactorily proved in a court of law. In several instances this has been done; there is such a case presently pending in a district court.

The third group of state agents involved in pollution abatement are the coastal waste control inspectors and boat captains employed by the Department of Wild Life and Fisheries and under the administrative jurisdiction of the director of the Division of Oysters and Water Bottoms. These coastal waste control inspectors and boat captains confine their efforts to the observation of the methods of discharge of wastes from the coastal oil fields concentrated in southeast Louisiana, stretching from Terrebonne Bay east to the Mississippi line.

These men make periodic inspections of the various coastal oil fields and check for violations of the Stream Control Commission's "Rules Governing the Disposal of Oil Field Wastes." When violations of these rules and regulations are observed, the coastal waste control inspector makes a report in triplicate. One copy is left with the field foreman of the area involved, one copy is kept in the file of the Division of Oysters and Water Bottoms in New Orleans, and one copy is sent to the office of the Stream Control Commission in Baton Rouge.

From time to time the director of the Division of Oysters and Water Bottoms writes to the Stream Control Commission a list of certain oil field operators that are violating the rules with the statement that continued efforts on the part of the coastal waste control inspector have not brought about the remedying of the conditions complained of and at this time the Stream Control Commission causes notices to be sent to the oil companies involved, stating in general the violations of the Commission's rules and asking that steps be taken to remedy the violations. When this is not done to the satisfaction of the coastal waste control inspector the Stream Control Commission office is notified and "Cease and Desist" orders are issued.

An equally important phase of waste control presently is being carried on in the laboratories of the Department of Wild Life and Fisheries in Baton Rouge. This is the investigation into the physical, chemical, and biological characteristics of the various types of industrial wastes that are being discharged into the waters of the State of Louisiana. These investigations are being carried on by technicians working under the direction of the Stream Control Commission, by the biologists and chemists of the Department of Wild Life and Fisheries that are stationed in Baton Rouge.

These investigations have been confined almost altogether to the southwest Louisiana area and have consisted of a complete biological and chemical investigation into the Calcasieu River drainage system. In this system there is located two large oil refineries, a number of heavy chemical plants, three pine products plants, and a large number of oil fields. The investigation of the river has been completed as far down as the City of Lake Charles itself. The investigation of the Calcasieu River down to Cameron is presently being carried on.

Another investigation by the Stream Control Commission personnel is that carried on to ascertain the effects of discharge of oil field brine on the Little River drainage system in the central part of the state. This is a highly developed recreational area and the purpose of the investigation is to ascertain the effect of discharge of oil field brine on the aquatic fauna of the receiving streams which flow through Catahoula Lake and on down into the Red River.

There have been reports of various specific industrial wastes that have been completed by the group as of the date when this report is being written. They involve the characteristics of the waste from each of the individual manufacturing establishments in the upper Calcasieu area.

FINANCIAL REPORT

The budget of the Department of Wild Life and Fisheries for the past biennium has been more than adequate because it has been supplemented by federal funds granted to the Stream

Discharge lines leading from Cinclare Factory to Mississippi River, West Baton Rouge Parish, La.

Control Commission by the Congress of the United States through the U. S. Public Health Service. These funds average about $16,000 a year and are used to pay salaries and expenses of technical personnel and to purchase equipment for use by these scientists.

The budget of the Department of Wild Life and Fisheries is adequate to hire all personnel presently available for use. By that I mean that the supply of engineers and aquatic biologists is extremely limited and while such personnel could be used here in the state they can not be had. In fact, the personnel now working for the Stream Control Commission have been reduced in number by the leaving of one engineer in December and prospective leaving of another engineer in April.

The supply of competent aquatic biologists is extremely limited. The training of such biologists is carried on in just a few places in the United States and the men graduating from the institutions giving such courses are in good demand. The funds allotted to the Division of Research and Statistics have been adequate for the purchasing of all necessary field equipment and transportation equipment needed to carry on the work throughout the state.

The moral support given the Research and Statistics personnel and the Stream Control Commission personnel by the commissioner of the Department of Wild Life and Fisheries and by the Stream Control Commission has been excellent and the effect of this morale on the Division personnel and the Stream Control Commission personnel has been high and the work has been carried on with vigor.

STAFF AND COVERAGE

The staff of the Division of Research and Statistics consists of one director, who is a chemical engineer and a qualified professional engineer of the State of Louisiana; one chemist, extremely capable in the performance of duties; one biologist, an aquatic biologist qualified as above; five waste disposal inspectors, adequately trained and capable of carrying on the work; two clerical personnel located in the office; one coastal waste control inspector who is under the administrative jurisdiction of the Division of Oysters and Water Bottoms.

In general the following will be a discussion as to how the state areas are divided up for the pursuance of stream pollution abatement. The state is divided into four areas—the Calcasieu basin area, north Louisiana area, southeast area, and the rice growing area.

The Calcasieu area is one of the most important areas in the state of Louisiana as far as industrial development is concerned, being second only to the north Baton Rouge area. There are a great number of oil fields located in this area; Lake Charles is a major port, and a group of major industrial establishments are concentrated in the vicinity of Lake Charles.

One of the principal agricultural occupations in the Calcasieu area is the growing of rice, and this makes it highly important that the waste disposal inspector assigned in the Calcasieu area be capable of supervising the discharge of oil field brine and other chloride bearing wastes in such a manner that the rice irrigation waters are not contaminated. Much valuable assistance has been given to the Research and Statistics employees stationed in the southwest Louisiana area by the district engineer for the Department of Conservation located in the City of Lake Charles. Working through Conservation Department personnel, the district engineer has greatly aided in the program of the prevention of contamination of the rice irrigation waters.

The next area to be considered in the overall survey of the state-wide stream abatement problem is that area located north of the City of Alexandria and commonly called by this division office the north Louisiana area. There is a good deal of widespread industrial activity in the north Louisiana area with a concentration in the Shreveport area, some around Monroe, and a certain amount north of Alexandria, above the City of Hodge There are a large number of oil fields in north Louisiana, some stripper fields that are the source of a good deal of brine pollution.

In north Louisiana there are four paper mills and two new butane storage facilities. These last two require some comment because of the newness of this type of industry. Nonproductive salt domes are used and cavities in these salt domes are washed out by the use of water and the resulting brine is stored in large surface reservoirs. The cavities in the salt domes are enlarged until sufficient volume is had for the storage of great volumes of liquefied petroleum gas, commonly called butane. During the summer months when the requirements for butane are low the liquefied gas is purchased from the various refineries throughout the state and is pumped down into the cavity in the salt dome, and there it is kept until the fall and winter months. When the demand for the gas becomes great as the result of a demand for heating and cooking purposes, the brine which was produced in making the cavity is pumped down into the storage area to force out the butane gas which is then shipped in tank cars.

The only pollutional danger involved in an industrial establishment of this kind is the possibility of loosening a levee wall and the discharge of the accumulated brine. This has already happened once since these new industries have been established, but in this particular case no great damage resulted. Steps will be taken to see that such damage does not recur again.

As far as the oil fields in north Louisiana are concerned, the main problem of disposal of oil field brine is to avoid damaging the aquatic life in the north Louisiana streams and lakes. There is little if any crop irrigation in north Louisiana; so the problem is purely one of protecting the aquatic life in several streams. In all cases where production is flush, that is where the wells are flowing and where there is an excellent income from the fields, it has been the policy of the Stream Control Commission and the Department of Wild Life and Fisheries to require that salt water wells be used for the disposal of oil field brine—that is, that the salt water is disposed of underground. Where the fields are depleted, so-called stripper fields, the application of such a policy to the stripper fields would result in the closing in of the fields and an abandonment of the field as a source of oil.

As of this date the policy regarding the disposal of oil field brine from stripper fields has not been formally established. Eventually it is thought that some steps are going to have to be taken to cut down the amount of oil field brine that is coming from such fields as Caddo Pine Island, Tullos Urania and similar fields in north Louisiana.

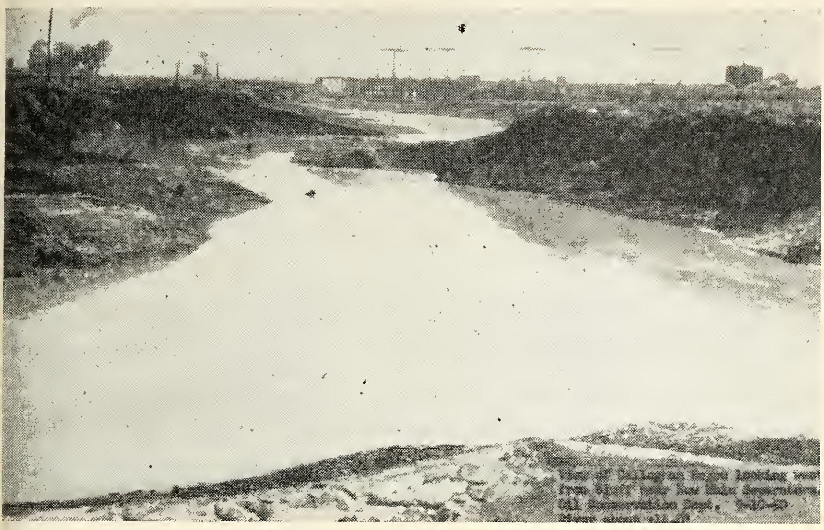
The disposal of gravel plant washings in north Louisiana used to result in the contamination by turbidity of a number of the good fishing streams in north Louisiana during periods of low stream flow. A strict enforcement policy, which called for the complete removal of such turbid gravel wash water from the streams during the time when such wash water would materially affect the condition of the stream, has resulted in almost complete abatement of this type of stream pollution. The problem remaining is one of good observation and inspection to keep conditions as they now exist.

The pollution caused by the discharge from the several paper mills in north Louisiana has been materially reduced in the last two years, and it is with pleasure that it can be said that in two places in north Louisiana—in the Bodcau area and in the Bastrop area—that outside of dark color of the water during certain times of the year it is found to be in good condition with no damage to fish life. The situation has been remedied to the point that the complaints no longer are made regarding the discharge from these industrial areas. This matter will be gone into in another part of this report in much greater detail.

In the southeast portion of the State of Louisiana, we find the metropolitan area of the City of New Orleans with a concentration of industrial establishments; we find the City of Baton Rouge with the most heavily concentrated industrialized section in the United States. Directly south of Baton Rouge and southeast of New Orleans we find the sugar cane grinding area.

The sugar producing industry in the State of Louisiana probably constitutes the most important single-industry-wide pollution problem that is facing the Stream Control Commission and the Department of Wild Life and Fisheries today. The reasons

Air view of the Calahan Bayou area with the Esso Standard Oil Refinery in the background.



for this are numerous; one of the main factors is that the sugar cane industry has been suffering from a lack of high income for a number of years, and this means that the funds available for waste control work are extremely limited.

There are three areas of cane sugar production—the Mississippi River area, which would be along both sides of the Mississippi River from Pointe Coupee Parish down to Reserve; the Bayou Lafourche area from the junction of the Mississippi River down to a point considerably below Thibodaux; and the Bayou Teche area along Bayou Teche itself. The great majority of the raw sugar factories located in the three areas were built many years ago and suffer from a need of modernization. The equipment is old and the design is obsolete. In a good many cases the towns and urban areas have grown up around the factories located on the bayous, and this further complicates matters by restricting the use of lagoons and storage basins.

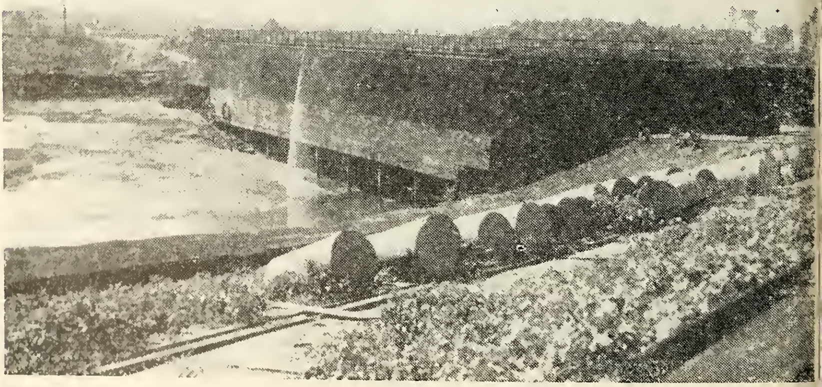
In the Mississippi River area those mills located close enough to the river can discharge into the river and the others must of necessity discharge into water bodies with lesser flows. The sugar industry will be gone into in much greater detail a little later on in the report.

There are a large number of gravel plants located in the area north and east of the City of Baton Rouge, especially on the Amite

River and its tributaries. The lessening of pollution from these installations has become increasingly important as the city area of Baton Rouge has turned to the Amite area for camp and picnic areas and for swimming, boating, and fishing. The cooperation of the gravel plant owners has been good and the condition of the Amite has been materially improved during the last two years. For long periods of time, especially during times of extreme low flow, the Amite has been clear and in very good shape for all recreational purposes.

Difficulty has been encountered by several small industrial units located in and around Baton Rouge in disposing of wastes that are commonly not encountered throughout the state. Cooperation from these establishments in general has been poor, but steps have been taken to force compliance with Stream Control Commission rules and state laws regarding the discharge of oily wastes.

There are numerous oil fields in southeast Louisiana, especially southwest of the Mississippi River in the Bayou Teche and Bayou Lafourche areas. The pollution from these fields has been reduced to a minimum and with the exception of the discharge of oil field brine the problem that existed for such a long time regarding the discharge of wastes from these oil production areas has almost disappeared. The cooperation obtained from the production section of the major oil companies has been excellent. It has been found that all that is necessary to clear up conditions



Close up of dam in Master Separator showing oil baffle at elevation +49.0'. Oil Conservation Department—Aug. 1951.

found to be in violation of the state laws or the Stream Control Commission rules is to bring the condition complained of to the attention of the head of the production section, and the situation will be cleaned up immediately.

There are a number of food packing plants in this area, mostly those handling sea foods. There has been a decrease in the number of complaints regarding pollution from these sea food packing factories in the last two years, probably because of routine inspections. The installation of fine mesh screens and the abandonment of the practice of throwing shells and other solid particles had minimized the pollution coming from such packing plants.

Difficulties have been encountered in the past in the packing of such items as sweet potatoes and green beans because of the discharge of peelings and other small particles of the vegetables, but again the installation of fine mesh screens and the doing away with the practice of discharging hulls and bits of the material being packed has reduced this problem to one that can be considered almost unimportant.

KRAFT PAPER MILLS

In the past two years considerable progress has been made in reducing the pollution from the several paper mills located in the State of Louisiana. The production here in the state is the second largest in the United States totaling some 3,400 tons per day. Five or six years ago the writer considered that the kraft paper mill waste problem was one that could never be solved completely and adequately because of factory locations, rainfall, etc.

The results of the last four years have proved this opinion to be wrong. Changes that have been made inside and outside of the mills have proved so effective in a great majority of the cases that pollution, while still very obvious at certain times of the year due to color, is no longer a real vital problem in the areas involved.

One of the real reasons for this change for the better has been the change in the attitude of managements of these very large mills in north Louisiana and east Louisiana, especially the one located in Cullen, Louisiana, the Springhill mill of the Southern Kraft Division of the International Paper Mill. This mill produces in the neighorhood of 25 million gallons of waste every 24 hours, seven days a week, 365 days a year. This waste is impounded for about 10 months out of each year. At the end of the 10 months impounding period there is behind levees about 1¼ billion cubic feet of wastes or roughly 10 billion gallons.

This waste has several objectional characteristics. The most important one at the present time is that it has very black color. It used to be that the biochemical oxygen-demand of the waste was another very objectional feature, but changes inside the mill and B.O.D. reduction while being impounded has resulted in the cutting down of the B.O.D. of this waste to around 100 B.O.D., which is a very considerable improvement over what it used to be several years ago. But the main change that has taken place in the Cullen Mill is the decision by management to put the problem of discharging this waste with the least amount of harm into the hands of the technical personnel of the mill.

The effect of this has been that in the last two years the discharge, to my knowledge, has caused no fish mortality. The dissolved oxygen content of the receiving stream has at no time fallen below two parts per million during the period of discharge and not down to the point of depletion at any time immediately following the time of discharge. Of course, the black color which is very objectional is still there, but the discharge takes place during the late fall and winter months when the stream flow is high and when the water is not being used for recreational or sport fishing purposes.

The color of the water does not seem to affect the run of rough fish—this being the opinion of the several commercial fishermen operating in the drainage area. In northeast Louisiana at Bastrop, there is located the Bastrop and Louisiana mills of the Southern Kraft Division of the International Paper Company. During the last biennium the company has completed the Bastrop impounding basin to impound the waste coming from these two installations for a period of about six to eight months out of each year. This means that during the periods of extreme low flow that no black water will go into Bayou Boeuf and lower Bayou Lafourche to interfere with the use of these waters as a source of water for cattle or for irrigation purposes or any other purposes for which these waters might be put.

This impounding basin is tremendous in size. It covers an area of about 7½ square miles, has about 25 thousand acre feet between leeves. This leeve area will impound the total waste from these two mills, the treated sewage from the City of Bastrop, and the rainfall from about 67 square miles of area immediately around the town of Bastrop. All of this combined effluent will be impounded until the flow in the receiving stream is sufficient to dilute this water to the point where it will not be harmful. The B.O.D. of the wastes flowing into Little Bayou Boeuf immediately above the impounding area is about 150 to 200. The B.O.D. of the waste at the point of discharge from the basin itself after an impoundment period of three to four weeks was reduced down to an average of five B.O.D., which is of no importance under these conditions. The pollutional properties of the wastes have been almost completely removed, and the only thing remaining is the color, which is an intense black. If the dilution available is sufficient and the receiving water which is normally black is of great enough quantity, this color will not be too apparent.

The Southern Advance Bag and Paper Company installation at Hodge continues to be able to operate without damaging the lower regions of Dugdemona River or Little River to any great extent. The upper regions of Dugdemona River have from time to time been completely depleted of dissolved oxygen and in several cases fish mortality has resulted. It is believed that eventually additional impounding areas will have to be developed in the vicinity of Hodge so that discharge during stream low flow conditions can be restricted to the point that dissolved oxygen depletion will not take place in the upper regions of Dugdemona River.

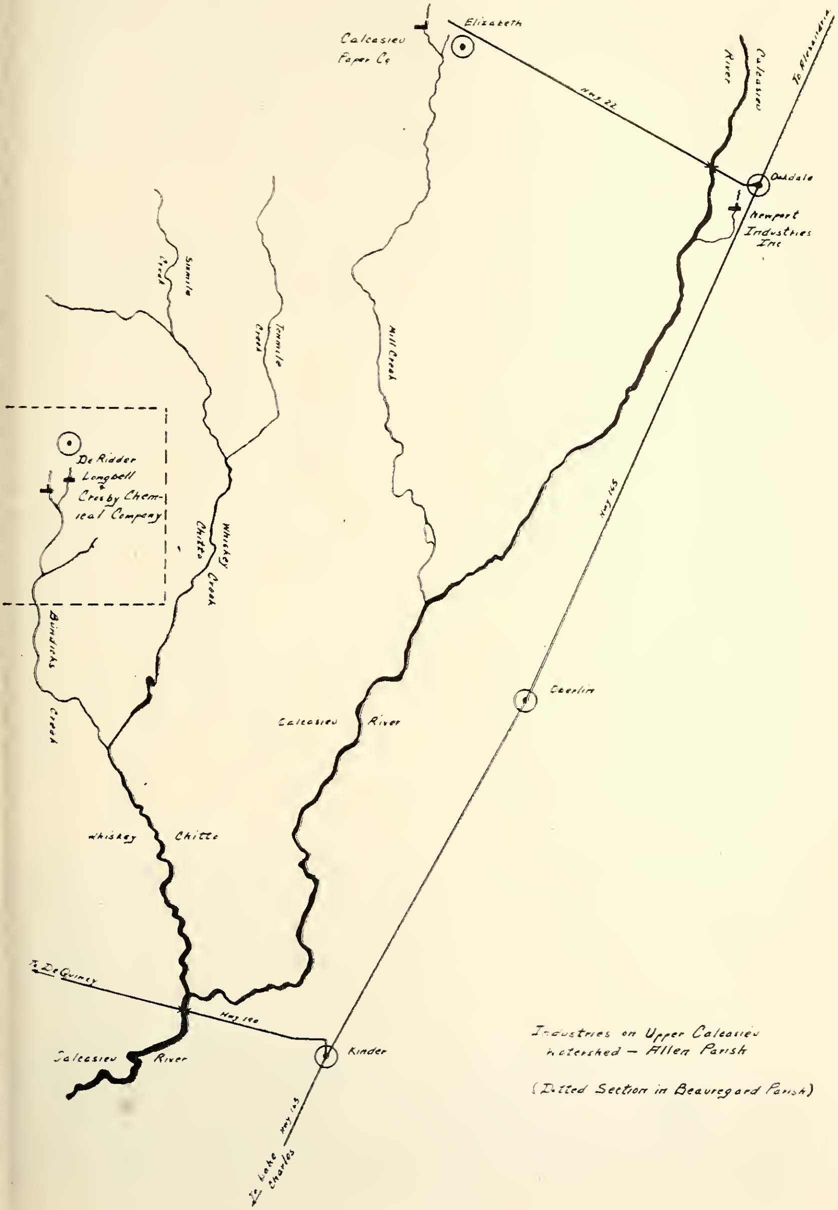
The river in the vicinity of Winnfield and below, and Little River itself, do not give any evidence of being harmed by the discharge coming from the mill. The black liquor that is impounded throughout the dry months and discharged in periods of extreme high flow is handled without causing any change in the condition of lower Dugdemona River.

The kraft paper mill located on Pearl River in southeast Louisiana has made considerable progress in reducing the pollution qualities of the wastes discharge into Bogalusa Creek, hence into Pearl River. There have been a number of complaints regarding the condition of Pearl River below Bogalusa to the point that the Stream Control Commission requested that the U.S. Public Health Service make a complete survey of the Pearl River in the vicinity of and below Bogalusa to ascertain whether or not the pollution which was alleged to have existed in the river actually did exist and to what degree the river was being damaged.

This survey was started in the fall of 1950 and was continued for about five weeks. The stream was analyzed chemically and biologically, and a report was written and submitted to the Stream Control Commission in July, 1951. The evidence tended to show that conditions existing in the river during periods of low flow were marginal and that, while conditions were not too bad within a period of 15 miles below the mill, any immediate change in operating conditions—spills, pull overs, or any of the innumerable things that could go wrong inside a paper mill and throw an additional load on Pearl River—would result in oxygen depletion. That this could happen was illustrated by the fact that there was a good deal of fish mortality reported in October, 1950. Whether this was due to the discharge from the Gaylord Container plant cannot be stated, but evidence tends to show that it did originate at this point. Continued study of the report and other data being made available to the Stream Control Commission will allow the Commission to make certain recommendations to the management of the Gaylord Container Corporation regarding some additional safeguards which might be taken to make sure that the river is not "slugged" during a period of plant breakdown or some similar condition.

From time to time during the last four years efforts have been made to cut down the pollution of the Calcasieu River as the result of discharge of the kraft mill wastes from a mill located in southwest Louisiana. The condition of the river was bad enough prior to the enlargement of the capacity of this plant but became very bad immediately after the capacity was tripled.

Every effort was made to gain the cooperation of the management of this mill to a point that the pollution of Mill Creek and the Calcasieu River could be reduced to a minimum. This was not brought about, and a "Notice of Determination" of pol-



Industries on Upper Calcasieu Watershed — Allen Parish

(Dotted Section in Beauregard Parish)

lution was filed with this company by Wild Life and Fisheries agents several years ago. Conditions did not materially improve following receipt of this "Notice of Determination," so the Stream Control Commission issued a "Cease and Desist" order in the fall of 1950. This "Cease and Desist" order was violated by this company, and charges were filed in the fall of 1951 alleging the violation of the Stream Control Commission order. This case is presently pending in the 14th Judicial Court.

The kraft mill located on the Ouachita River at Monroe, Louisiana, has been one of the most successful of all of the mills of the state in cutting down the chemical content of the waste by making changes inside the mill itself. The changes made inside the mill have resulted in cutting down the 10 million gallons of wastes discharged from this mill to a point that seldom is there a complaint made regarding the condition of the Ouachita River below Monroe, especially in the vicinity of Columbia. In times past complaints would come from Columbia regarding the condition of fish caught in the Ouachita River, fish were killed in the vicinity of Lock No. 3 at Riverton, and minnows held in wholesale bait dealers' holding tanks were killed by the water, etc. It is pleasing to be able to state that in the past several years the condition of the Ouachita has steadily improved and that the increased rate of flow that will be brought about as a result of impoundments in Arkansas will cause further improvements to a point that it will no longer be a problem for the Stream Control Commission and the Department of Wild Life and Fisheries.

Catherine sugar cane factory at Lobdell, La.

CANE SUGAR MILLS

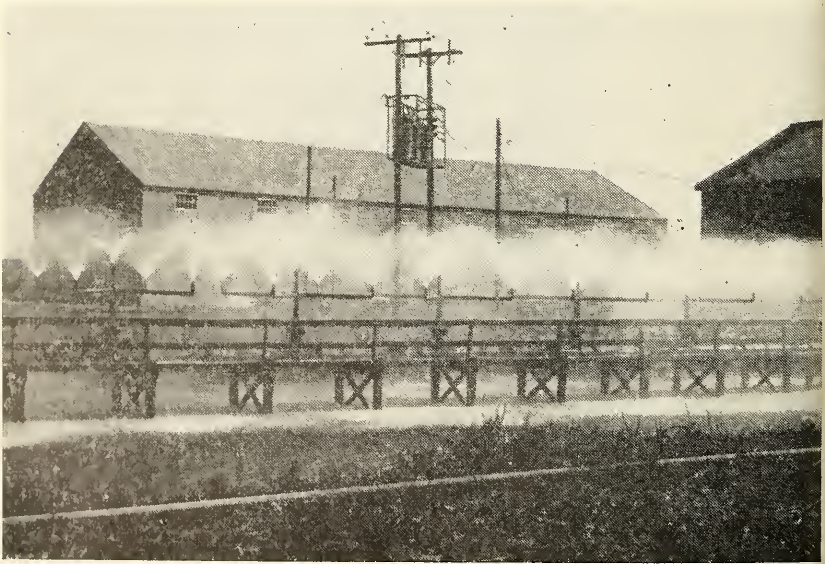
It is the writer's opinion that the pollution problem resulting from the discharge of wastes from cane sugar mills is probably the most important industry-wide waste problem facing authorities in the State of Louisiana today.

Almost all of the sugar mills in the State of Louisiana were designed to use a barometric condenser to pull vacuum on the triple and quadruple effects, and on the pans. These condensers require a large amount of cooling water, as cooling towers and ponds are relatively insufficient in this climate, due to high humidity. The water coming from these ponds is too warm to use in a barometric condenser. Volumes used average about 60,000 gallons an hour for a medium size mill. In addition to the waste water coming from the barometric condensers, there is clarifier mud coming from the juice clarifier, sweet water, factory wash water, and the acid-alkali cook or washout water. The last named wastes, starting with the clarifier mud, are no longer discharged into the state water bodies. They are impounded and disposed of by seepage, by evaporation or by discharge during high stream flow. This resulted in cutting down the pollution of streams by sugar mill wastes until the introduction of the mechanical cane cutter which was developed to allow the harvesting of cane in the absence of suitable field labor.

These mechanical cane cutters operate in such a manner that the cane arriving at the mill is dirty and must be washed. The organic matter washed off of the cane and into the receiving streams as a result of this operation is equivalent in amount to that which was taken out of the bayous as the result of the impounding of the clarifier mud and the other allied wastes, so we are exactly in the same position as we were several years before the start of the abatement program for the sugar cane industry.

Of all the streams in the sugar grinding area, the Mississippi River is the only stream that has sufficient volume available to dispose of the wastes in such a manner as not to cause pollution of the receiving stream. The problem is a difficult one, and the answer is not readily available.

Cooling pond for condenser water prior to reuse at the Catherine sugar cane factory at Lobdell, La.



Spray pond used to cool sugar mill condensor water prior to reuse, Catherine Sugar Mill, West Baton Rouge Parish, La.

Condenser water line and clarifier mud line discharging into the Mississippi River, from the Cinclare factory, at Cinclare, La.

The work done by the Louisiana Department of Wild Life and Fisheries personnel during the sugar grinding season can be divided into three parts. The first is the pregrinding survey, during which time the chemical conditions of all water courses involved is determined. The pH temperature, dissolved oxygen content, and biochemical oxygen demand are run on each of these water bodies. Then during the grinding season these tests are run on the stream water, mill intake water, and mill discharge water to ascertain the amount of the B.O.D. load that is presently being put into the stream by the factory discharging the wastes and the condition of the receiving stream itself.

After the grinding is over, tests are used to determine the rate of recovery of the polluted stream, and these tests are continued until the stream reaches its pregrinding condition. One of the means of remedying some of the pollution outlined above has already been discussed, and this is the impounding of as much of the waste as would be necessary to cut down the polluted content of the wastes and to maintain a minimum of two parts per million of dissolved oxygen in the state waters. This is the minimum amount of dissolved oxygen necessary to keep fish from dying from lack of oxygen. The supply of additional amounts of fresh water would have beneficial effects, and it is possible that this can be done in the upper Teche and at the head of Bayou Lafourche. In all other areas in the state, the only remedy seen at the present time would be the complete impoundment of the sugar mill wastes.

Frozen sugar cane abandoned in the field in West Baton Rouge Parish.

PINE PRODUCTS PLANTS

There are two types of pine products plants located here in Louisiana—one is the destructive distillation process, and the other the solvent extraction process. The destructive distillation process is one in which the pine stumps are ground into chips, which are then put into retorts and heated until nothing but charcoal remains. All of the volatile substances in the pine are condensed and the condensed material is fractionated into its several components, such as methyl alcohol, creosote, acetic pyrogallic acid, and other allied chemicals. The charcoal is used for any number of purposes, and the other chemicals are sold for other various uses. The creosote is used to treat timber.

The most common type of plant here in Louisiana is the solvent extraction plant, in which the pine stumps are brought into the plant, washed, ground up into small pieces, and the chips extracted by means of a solvent, usually naphthol or benzene or occasionally some similar organic material. The solvent with its entrained products is evaporated and the solvent recovered. The various fractions are broken down into such things as rosin and turpentine, and sold in those forms.

The one destructive distillation plant located in the state is located at Covington. If waste is discharged from this plant it would flow into Miles Branch, then into the Tchefuncta and on into Lake Pontchartrain. Very little if any waste is discharged from a plant of this type. However, if such waste is discharged, it is found to be highly toxic and to have considerable biochemical oxygen demand. The combination of these two characteristics means that if any great amount of waste is discharged fish mortality will take place as a result of oxygen depletion or direct toxicity. In this particular case, the occasional use of Miles Branch as a means of disposal has caused very little difficulty. However, in the past, fish mortality has taken place in the lower regions of Miles Branch, probably as the result of oxygen depletion.

Also located in Covington is a pine products plant operating with the solvent extraction process. The discharge from this plant also goes into Miles Branch. One of the characteristics of this discharge is that the waste contains a certain amount of entrained turpentine and similar compounds. It has some toxicity, not too much, but has a good deal of biochemical oxygen demand so that any amount of wastes getting into streams with insufficient flow will result in fish mortality due to the removal of oxygen in the stream. There is no question about having any great amount of aquatic life in Miles Branch, but it is believed that the combined discharge does not damage Tchefuncta River. A bio assay is now being carried on to determine the effects of the discharge of these two mills on the lower regions of Tchefuncta River.

Another pine products plant utilizing the solvent extraction process is located at Oakdale, Louisiana, and it is one of the largest plants of its type in the south. The waste discharged from this plant flows through a ditch for some several hundred yards, then into an impounding basin and from the impounding basin into the Calcasieu River. The chemical characteristics of the wastes discharged from this plant have undergone considerable change in the past several years, as much work has been done to decrease the polluting content of the waste.

Certain wastes are evaporated to dryness by the use of subsurface combustion apparatus, another part of the total plant waste is impounded in a basin and held for discharge during periods of high stream flow and still another part of the waste is put through a trickling filter of pilot plant size to determine the effectiveness of this filter in reducing the B.O.D. of the treated wastes. This concern has shown a great deal of interest in reducing the effects of waste discharge on the Calcasieu.

Although fish mortality has occurred in the river from time to time as result of the discharge of this waste into the river, it is believed that eventually the situation will be fully under control. The experimental work is in the hands of a firm of consulting engineers, and the company has shown every desire to cooperate with the Department of Wild Life and Fisheries in keeping trouble from the discharge to an absolute minimum.

Another new and modern plant is located at DeRidder, Louisiana, and the wastes flowing from this plant enter Palmetto Creek, then into Bundick Creek and through Bundick Creek into Whiskey Chitto and so into the Calcasieu River. In times gone by this water system was one that had a good deal of fish mortality as the result of the discharge of wastes from the DeRidder area, not only from this particular plant but also from high B.O.D. wastes coming from the domestic sewage from the City of DeRidder. The City of DeRidder installed a primary treatment plant which cuts down the B.O.D. of the domestic sewage being discharged into Bundick Creek by about 35 per cent, and at the same time the pine products plant put into operation an extensive program of water reuse. The main part of this water reuse program involved the recirculation of water used for washing stumps prior to grinding. This washing is necessary because all sand and silt must be removed from the stump before cutting takes place.

Another part of the water reuse program involved the recirculation of the cooling water and exchange water. All in all, the condition of Bundick Creek has improved in the last several years. In 1947 the water of Bundick Creek was in very bad shape, it had a metallic luster, and there was little or no fish life in the upper reaches. At the present time, the water is clear and green and numerous large mouth bass can be found high up in the creek.

Another solvent extraction type of pine products plant is located at DeQuincy. This one presents the most difficult pollution problem to be found in the southwest Louisiana area. The waste from this plant flows down Buxton Creek into Houston River. The Houston River rises in the upper part of Beauregard Parish and flows south to a point almost due west of Lake Charles and then turns and runs east to a junction with the Calcasieu River.

The small drainage area eliminates the possibility of having a large stream flow during the summer months, and in addition the river is affected by tides so that there is just not enough flow in the Houston River to assimilate the wastes coming into it from Buxton Creek. The only hope in sight to clear up this condition is that it might be possible that the knowledge gained at the company's Oakdale plant could be put into practice at the DeQuincy plant to cut down the waste load to the point that the Houston River could assimilate the wastes even at periods of low flow.

There have been several petitions received by the Department of Wild Life and Fisheries regarding the pollution of the Houston River and it is felt that a hearing should be held in the near future in connection with the pollution of the river in an effort to work out an equitable solution for all concerned.

WOOD CREOSOTING PLANTS

Working hand in hand with the great lumber industry of the State of Louisiana is the timber creosoting industry, which is scattered throughout the state with light concentrations in the Alexandria area, in and around Lake Charles and around Shreveport. The nature of the creosoting process is such that some of the most potent and toxic wastes to be found anywhere in the industrial world come from the creosoting process as used here in the state. The different parts of the process develop different types of wastes. Barometric condensers are used to pull a vaccum in the creosoting chamber, and this results in a liquid being extracted from the pine being treated. This liquid collects at the bottom of the chamber and is drained off. It has an extremely high B.O.D., as it consists almost entirely of water in which are dissolved wood acids and allied substances. It is very toxic to fish because of its chemical content.

The second type of waste that comes from the creosoting plant is creosote that actually comes onto the ground after dripping off the timbers after they have been removed from the creosoting chamber. This creosote on the ground will remain there for many years unless it is physically scraped up and disposed of in some manner or another. The only answer that is presently available for the cutting down of pollution resulting from the operation of creosote plants is the impounding of these wastes and allowing either the disposal of the waste only during periods of extreme high stream flow or the evaporation of such wastes. Evaporation is usually not very feasible in south Louisiana because of the high humidity, but it is possible in the Alexandria and Shreveport areas and to a certain extent in southwest Louisiana. In any event, it is imperative that all waste of this type be kept out of streams during low flow periods.

OIL AND GAS FIELDS

The oil and gas production in the State of Louisiana is divided rather sharply into north and south Louisiana by a barren strip lying across a narrow neck of the state, a little bit south of the City of Alexandria. Of course there are some few fields in the area but not very many in relation to the total number of fields in north and south Louisiana. In the consideration of the oil and gas pollution problem in the state, we should first off consider southwest Louisiana with its own peculiar problem and that is for many months out of the year the waters of that area must be kept free of brine so that it can be used for rice irrigation. This has been realized by the legislature of the State of Louisiana in the early days, and laws were passed which prohibited the discharge of oil field brine into rice irrigation waters from the first of March until the fall.

This act is supplemented by the Stream Control Commission regulation which prohibits the discharge of oil field brines into any waters used for rice irrigation after the 15th of January of each year, and until such time as the Stream Control Commission determines that the waters are no longer to be used for the rest of the year for rice irrigation, at which time the impounded brine could be discharged with the positive assurance that such discharge would not result in the killing of fish.

In the 10 years that have passed since the enactment of the Stream Control Commission Act, the contamination of rice irrigation waters by oil field brines has almost become a thing of the past. When it does occur, it is usually a deliberate step on the part of some operator who is caught with full retention basins and feels that the discharge must be made in order that oil production might continue.

All the operators in southwest Louisiana are very much aware of the seriousness of the problem of keeping the waters free of chlorides and cooperate to the fullest extent. This also applies to the several heavy chemical plants located in the vicinity of Lake Charles. These heavy chemical plants producing chloride wastes have large impounding areas and use these areas to impound all chloride wastes the same as the oil field operators do.

In the coastal areas of Louisiana, in Terrebonne, Lafourche, Plaquemines and St. Mary, down on the lower coast, the problem of the discharge of oil field brine is one that is presently a point to be discussed and argued, inasmuch as allegations have been made that the discharge of oil field brines into brackish waters affects the environment to such an extent that aquatic life is seriously damaged. Other than that, the coastal waters are probably more free of contamination by oil wastes than at any time since oil was first discovered in the areas adjacent to the Gulf of Mexico.

The problem is acute in north Louisiana when it is considered that a great deal of oil field brines produced in the stripper fields are discharged through our fresh water streams and either go into the Red River or into Sabine River. It is beyond question that the discharge of these brines into these fresh waters seriously affects the aquatic life in these streams, sometimes to the point that these streams are sterilized and no life of any sort exists either in the water or on the bottom.

Where production in the field is flush, where wells are flowing and where the fields are under proration by the State Conservation Department, it has been the policy of the Department of Wild Life and Fisheries and the Stream Control Commission to require that all oil field brines produced be disposed of underground. This policy has been followed in LaSalle Parish, in the eastern part of the state and along the northern part of the state, all the way over to Caddo Parish. Where this policy falls down is that it does not cover the brines produced in the stripper fields; those fields that are so old and that have so little production that the wells can and do produce 99 barrels of oil field brine for each barrel of oil produced.

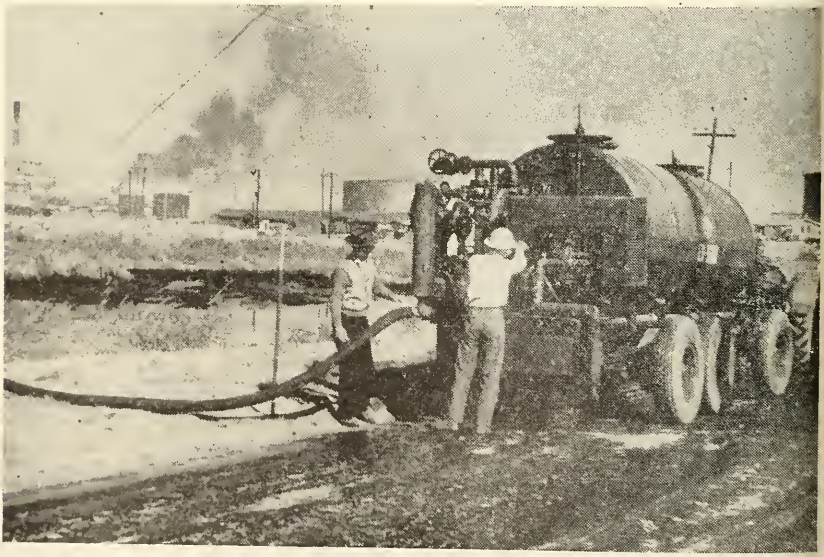
Any attempt on the part of the Department of Wild Life and Fisheries to require that brines produced in fields of this type be disposed of underground would automatically close down these fields because there is not enough money made in the production of the oil to pay for the disposal of the brine.

The disposal systems that must be installed in oil fields are extremely expensive. The wells themselves have to be cased, conditioned and perforated and may cost as much as $20,000. Transite pipe must be used in the gathering systems in order to combat corrosion; this pipe, too, is very expensive. Inasmuch as the pipe cannot be bent and cannot support itself, all small gullies and draws in the area must, of necessity, be bridged. For one installation in particular in north central Louisiana the initial cost was in the neighborhood of $700,000 for the capacity to dispose of some 25,000 barrels of brine per day. The operating cost of such a system would probably run in the neighborhood of 35 to 40 mills per barrel.

Sometime in the near future a decision must be made as to what should be done with the brines produced in stripper fields. It probably will not be possible to continue with the present idea of letting the brine flow indiscriminately from these fields to destroy all life in the streams during periods of low water.

In general, the Stream Control Commission's "Rules Governing Disposal of Oil Field Wastes" have been fairly rigidly adhered to by the various oil field operators in the state. Now and again an operator will be found who will ignore the rules and regulations, at which time steps must be taken to require compliance. During the last few years a marked increase in the cooperative spirit shown by the oil operators in the State of Louisiana has been evident.

Studies have been carried on at the Division of Research and Statistics laboratory at Louisiana State University which show that adult fish can live in a concentration of around 14 thousand



Oil pickup truck salvaging spilled oil, Esso Standard Oil Co., Baton Rouge, La.

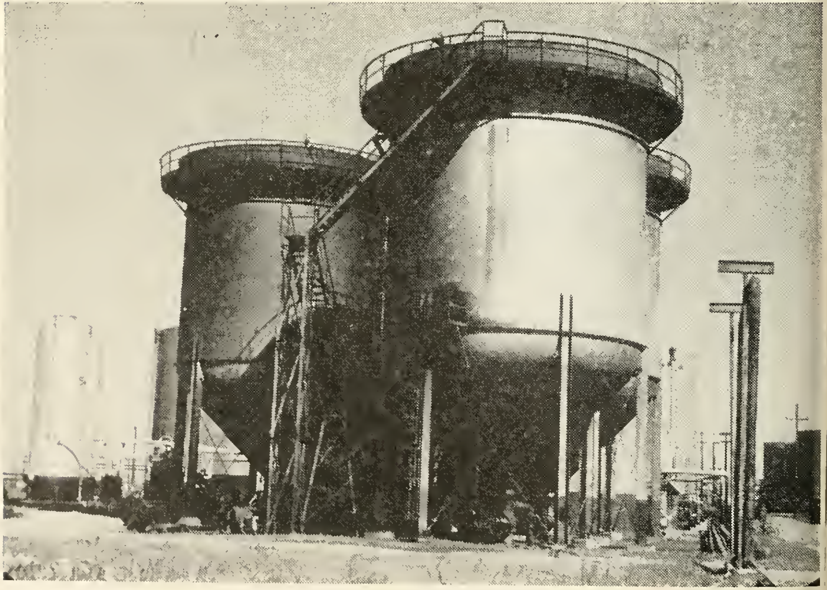
parts per million of chlorides but that immature fish, small fish, and fry, and such like that, cannot live under those conditions. This has been further proved by the fact that the toxic limit for chlorides for daphnia magna—a tiny food crustacea and an important food item of ordinary game fish—has been determined and it has been found that daphnia cannot live with the chloride concentration over 1,500 parts per million. In one stream in particular in the central part of the state it was found that absolutely no life existed except salt water mosquito larva because chloride concentrations were as high as 17,000 parts per million.

There are certain other toxic components of oil field brines, the so-called soluble fractions, components of petroleum which are more or less soluble in fresh or brackish water and which are themselves toxic to various forms of aquatic life. The effect of these water-soluble fractions on the fresh water fauna of the state has not been determined, but it is believed that they materially affect certain sections of the fish food cycle.

Before leaving the subject of the effects of discharge of oil field brines into waters of the state and the contamination of state water bodies with oil and other substances coming from the operations producing oil and gas, a review of the rules and regulations of the Stream Control Commission will be gone into in some detail. The Stream Control Commission adopted rules covering the disposal of oil field wastes in 1942, and these rules were amended several times, the last time in 1949. In general, the "Rules Governing the Disposal of Oil Field Wastes" have been drawn up in such a manner as to regulate the way in which oil bearing mixtures are discharged from the leases where they originate and the requirement is that the oil be removed completely before the water is allowed to flow across the ground into ditches or into streams or lakes or other water bodies. That is when the water itself can be discharged without violating the Stream Control Commission regulations.

Paragraphs 3 and 4 of the "Rules Governing the Disposal of Oil Field Wastes" have to do with the type of equipment that must be used around oil wells, oil booster pumps, tank batteries, pumping wells over water, drilling barges, etc., and the type of equipment and the manner of installation of the equipment that should be used in order to cut down the possibility of pollution while drilling for oil and gas. Incidentally, these rules and regulations were discussed with representatives from the oil companies before they were adopted by the Stream Control Commission. Paragraph 5 of the rules lists the requirements that have been drawn up to cut down, as much as possible, the possibility of having accidental losses of oil while barges are being loaded or towed. Paragraph 6 has to do with the requirements of the Stream Control Commission for the oil content of the brines being discharged, and Paragraph 7 has to do with the power of the Stream Control Commission to regulate the discharge of oil field brine and to prevent the discharge of such brine when it is determined that the discharge of that brine would be harmful to any industry or against the best interest of the state. Paragraph 8, the last paragraph, has a statement from the Stream Control Commission to the effect that wherever possible the oil field brine be disposed of underground.

The above rules are a promulgation of the Stream Control Commission and are regulatory in nature. There is a statute of the State of Louisiana—Title 56, Chapter 3, Part II, Sections 1451, 1452, 1453—which regulates the means of disposal of oil, salt water or noxious gases or substances into the natural streams of the state which destroy fish, and in Section 1451 it



Silt treating units, Esso Standard Oil Co., Baton Rouge, La.

states that no person shall knowingly and willfully empty or drain or permit to be emptied or drained from any pump, reservoir, well or oil field or any natural streams of the state any oil, salt water or noxious or poisonous gases in quantities sufficient to destroy the fish therein. Section 1452 gives the commissioner of the Department of Wild Life and Fisheries the power to supervise all such drainage. The last paragraph constitutes the punitive paragraph and says that for the violation of this particular act the penalty shall be a fine of not less than $100 or not more than $2,000 or imprisonment for not less than 30 days or more than 3 months for each offense.

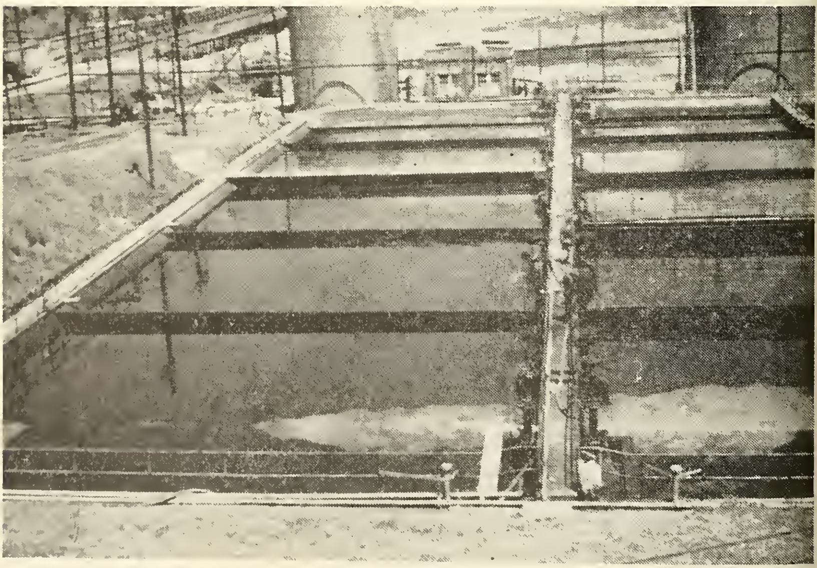
The other act having to do with the discharge of oil field brines into the waters of the state is carried under Title 38, Section 3, Part 4, Section 216, and says that no person shall knowingly and willfully drain or empty into or permit to be drained from any pumps, reservoirs, wells or oil fields into any natural streams of the state from which water is taken for irrigation purposes, any oil, salt water, other noxious or poisonous gasses or substances which would render the water unfit for irrigation purposes or destroy the fish in the streams. It goes on to say that the operators or owners of wells may turn their water from wells, reservoirs, or tanks into rivers, bayous, or streams or other waterways between September 1 and March 1 of each year and are prohibited from doing so between March 1 and September 1. The punitive clause of this act is strict and says whoever violates this act shall be fined not less than $100 or more than $2,000 or be placed in prison for not less than 30 days or more than three months and that each and every day that oil or other substances are permitted to flow into the natural streams or drainage shall constitute a separate offense.

This is the old Act 183 of 1920; so it can be seen that the laws covering the discharge of oil field brine into the waters of the State of Louisiana are adequate and that the policy having to do with the enforcement of those laws is the one that must be reconsidered from time to time.

PETROLEUM REFINERIES

The combined capacity of the state's petroleum refineries now exceeds a half million barrels per day. The refineries are concentrated in two main areas in the state. There are four refineries located on the Mississippi River and two in the vicinity of Lake Charles. The refinery located in the north Baton Rouge industrial area is probably the largest complete refinery in the western hemisphere, with a capacity of 250,000 barrels per day. There are over 700 different products made at this refinery. There is a complete chemical division; lubricating oil is finished and canned here. The petroleum bases used in the manufacture of insecticides are processed here and shipped to other places for compounding. The plant also produces the raw materials from which artificial rubber is made. These raw materials are transported to the several rubber companies located to the north of the refinery proper. To continue with the Mississippi River area, the two refineries close above New Orleans are relatively small in capacity at the present time, but both are in the process of being enlarged; and when the enlargement processes are completed, the combined capacity of the two plants will probably be in the neighborhood of 150,000 barrels per day. There is one small refinery below the City of New Orleans.

The north Baton Rouge refinery discharges about a quarter of a million of gallons of water per minute of various effluents. The discharges are made through a very elaborate system of oil separators and retention ponds. These separators are five in



New main separator, Esso Standard Oil Co., Baton Rouge, La.

number and are located in such a manner as to service the various unit processes, in addition to removing any oil coming through with storm waters that are drained off of refinery acreage. The main sewers are three in number and discharge water that has been used for cooling only, that has not come in contact with oil. The master separator which is actually installed in Callahan Bayou traps any oil that might get through the other separators and come to the surface in the bayou proper. This last separator adds the final touches to a really efficient recovery system. Outside of a possible taste and odor problem, little remains to complain about regarding the effluent coming from this plant.

The two refineries above New Orleans do not discharge into the Mississippi River but rather take the route across the Airline Highway and back toward Lake Pontchartrain in the vicinity of Norco and Destrehan. A good deal of work has been done by the larger of these two refineries in completing a new separator system. The main change is the taking of the water which used to flow down the barrow pit alongside the Airline Highway and putting it back through into a large open separator into Lake Pontchartrain. This program was completed about 18 months ago, 10,000 gallons per minute, was diverted back around the highway through a large six-section open separator and down the east guide levee of the Bonnet Carre Spillway into Lake Pontchartrain. The oil is completely removed from this water and there are no harmful chemicals dissolved in the water. The only characteristic that the water had that made it necessary to stop disposing of it in the barrow pit was that it was hot and caused a good deal of fog during periods of cold weather. The other refinery above New Orleans is enlarging and the characteristics of the waste now discharged will be so changed that no comments will be made about it at this time. The small refinery below New Orleans in the Chalmette area takes water from the Mississippi River, uses it for cooling, and discharges back into the lake area. This water is oil free. It has been used for cooling and in heat exchangers. The other process water that has come in contact with oil is put through separators before discharge.

In the Calcasieu River area the two refineries are both located west of Lake Charles, one above and one below the city. The combined capacity of these refineries is close to 200,000 barrels a day. The small refinery directly west of Lake Charles is now in the process of enlarging its capacity and will, when the enlargement is completed, be able to run about 50,000 barrels a day. This is a very modern refinery, although small in size, and up to the present time no difficulty has been experienced whatsoever in keeping its discharge from causing any pollutional difficulties whatever.

The large refinery located southwest of Lake Charles on the Calcasieu River uses Calcasieu River water almost exclusively for processing and cooling and returns about 210,000 gallons per minute to the river. Normally the return of this waste water does not cause any difficulty because although it has a slight B.O.D. the dilution is sufficient to handle this amount of demand and no damage results. However, under certain weather conditions, a large block of oxygen depleted water is formed in the river in the vicinity of the refinery. When weather conditions are right, these slugs of oxygen depleted water are pulled down into Moss Lake and fish mortality results.

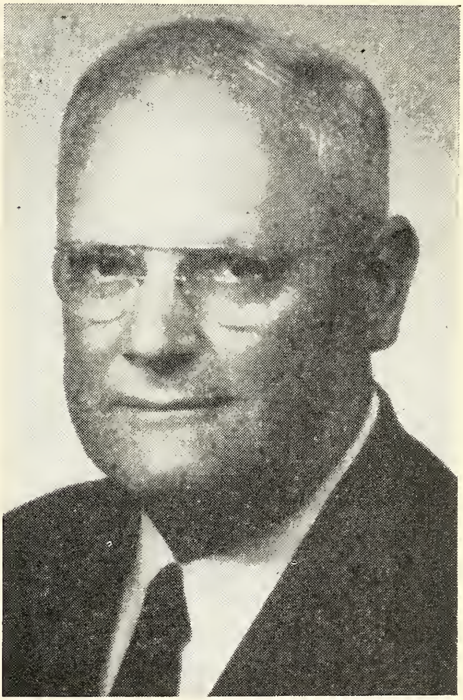
The conditions which cause this type of difficulty are as follows: There will be several days of strong south to southwest winds which will cut down the flow of the river to the south to a great degree and even reverse the flow of the river so that the water flows north to Lake Charles from the refinery area. This means that the water will be used twice by the plant and result in building up a tremendous volume of water that has been used once, twice, or even three times and has a B.O.D. of around 15 or 20 and no dissolved oxygen.

CONCLUSIONS AND RECOMMENDATIONS

It is believed that, aside from the problems involved in the abatement of pollution coming from cane sugar manufacturing, pollution abatement is making good progress here in the state. The only recommendations that can be made are that research be sponsored by the state into the nature of the wastes coming from the cane sugar factories, with a view to developing methods of treatment of such a nature that the methods can be adopted by the various sugar mills throughout the state. This would call for a low cost treatment and in most cases would involve the storage of wastes for time sufficient to stabilize the wastes prior to discharge.

REPORT OF DIVISION OF OYSTERS AND WATER BOTTOMS

James N. McConnell, *Director*



James N. McConnell

THE chief function of the Division of Oysters and Water Bottoms is to insure the productivity of the oyster bottoms of the State. To accomplish this, several important policies have been followed:

(1) *Shell planting and associated measures for reef improvement* — Reef improvement is a continuous and necessary policy of the Division. For example, to insure that there be a supply of oysters on reefs, this Division, (as authorized by law) requires all factories, corporations, etc. to return to the water bottoms of the State, ten percent of the shells removed by these concerns when taking oysters from the natural reefs of Louisiana. These shells are necessary as places for attachment for young oysters or spat.

A new harvesting machine has been purchased for the transplanting of oysters from heavily populated reefs to barren areas. This work is continuing and a new oyster seed ground reservation has been designated in Bay Gardene in Plaquemines Parish. The oyster harvester is transplanting seed oysters to that location.

LOUISIANA STATE UNIVERSITY LIBRARY

(2) *Leasing of bedding grounds to private individuals and corporations for their use in oyster production*—These oyster bedding grounds are leased by this Division. Surveying and allocation, as well as policing, are also handled by this Division.

(3) *Collections of rentals, licenses, privilege tax and royalties*—Rents for oyster bedding grounds, tonnage and dredging licenses, privilege tax, resale, shipping and shop licenses, and sand, shell and gravel royalties are collected annually. The total of these collections averages $190,000.00 yearly.

(4) *Regulatory measures for protection of reefs and bottoms*—Regulations governing seismic operations were formulated in cooperation with the various oil companies for the proper protection of oysters, fish, game and fur-bearing animals. These regulations are rigidly enforced and agents are placed with geophysical crews operating in the State.

(5) *Supervision of oil production activities to prevent pollution in coastal areas*—Due to the heavy increase in oil production in the coastal waters of the State, it became necessary to set up a special Coastal Waste Control Section to inspect and supervise oil production activities to prevent oil waste from contaminating the coastal areas.

A patrol boat with a Captain and a Waste Disposal Inspector constantly patrol these areas to enforce Stream Control Commission regulations. An airplane is used in coordination with the boat to patrol the coastal waters and locate oil well wastes.

(6) *Biological research for determination of facts which will guide the Division in its work*—Research is essential, particularly at the present time, for finding the facts necessary for combatting the decline in oyster production occurring in the State. The biological staff is now engaged in a program of scientific research designed to secure essential information concerning: (a) Improvements of oyster culture methods; (b) the effect on oysters of oil and sulphur field pollutants; (c) the indirect effect on oysters of seismograph operations; (d) the effect of competitors and predators; (e) the condition of the State oyster seed grounds.

Our investigations furnish the facts which we can use to intelligently place before the legislature for their consideration for changes in the laws which may be found necessary to protect and foster the oyster industry.

The staff of this biological section on January 1, 1950, was transferred to the Oyster Seed Ground Division which operates under Act 227 of 1944.

(7) *Regulations for severing sand, shells and gravel*—This Division regulates the taking of sand, shells and gravel from the water bottoms of the State. Leases and permits for these operations are issued and royalties collected.

(8) *Shell planting and rebedding oysters*—A special program of shell planting and rebedding of oysters from overcrowded reefs to better locations is being carried on by this Division under a special fund obtained from royalty collected on oyster shells and set aside for this purpose.

Watchmen are kept at camps built to protect the Seed Oyster Reservations at Bay Gardene, Sister Lake and Lake Felicity. These men issue permits to all fishermen obtaining seed oysters from these reservations and a record is kept of seed oysters so removed.

The Port of Entry at Grand Pass which was destroyed by the hurricane was rebuilt at Bayou Pierre a short distance east of its former location. An inspector remains at the Port of Entry at all times to check all of-of-state boats removing oysters and shrimp from Louisiana waters. A record is kept of the amount removed which must check with our agent in Biloxi, Mississippi, who collects all taxes assessed against Mississippi canning plants which obtain their oysters and shrimp from Louisiana waters.

In this report we will attempt to acquaint you with problems presently facing the Louisiana oyster industry and what steps are being taken by the Department of Wild Life and Fisheries to assist the industry to meet the ever changing and challenging conditions that face it today.

There are now three State departments involved: First, the Louisiana Department of Wild Life and Fisheries from whom the oyster fishermen leases water bottoms upon which to plant, cultivate and produce oysters.

Second, the State Mineral Board upon whom rests the responsibility of leasing areas beneath the state-owned water bottoms for the production of oil, sulphur, natural gas and other minerals.

Third, the Stream Control Commission whose responsibility it is to see that all laws relating to the placing of deleterous polutants in the waters of the state are complied with.

The ever increasing discovery of mineral resources and the increased possibilities of polutants entering our coastal waters where oysters are both cultivated and grown naturally must be recognized.

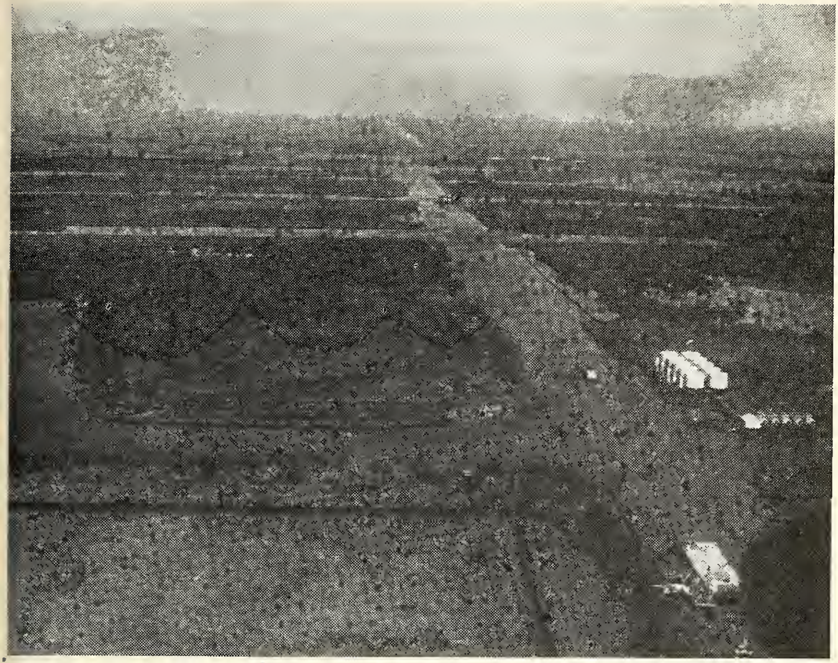
Inasmuch as the Stream Control Commission Act (#307, 1940) designates the Louisiana Department of Wild Life and Fisheries to be the enforcing agency for the Stream Control Commission, it has been the duty of the Division of Oysters and Water Bottoms to enforce the Commission's rules and regulations in coastal waters.

The Department five years ago bought two boats, each manned by a Captain and Coastal Waste Inspector. These crews continually inspected all of the oil fields in the coastal areas making written reports of conditions existing at each field. A copy of this report was given to the oil company involved, a copy to the Stream Control Commission and one copy remained in the files of the Oyster Division. Both crews were furnished with cameras and at the beginning of these inspections numerous photographs were taken showing heavy crude oil waste in many areas. All photographs are filed, both with the Stream Control Commission and the Department of Wild Life and Fisheries. Gradually, due to these careful inspections and with the cooperation given by all of the major oil companies and almost all of the smaller independents it became almost impossible to take any pictures of floating crude oil waste due to carelessness or neglect.

Conditions improved so much that even with the greatly increased production the department was able to dispence with the operations of one of the boats and today we are satisfactorily inspecting the entire area using one twin screw patrol boat having a cruising speed of 30 miles per hour.

CANALS

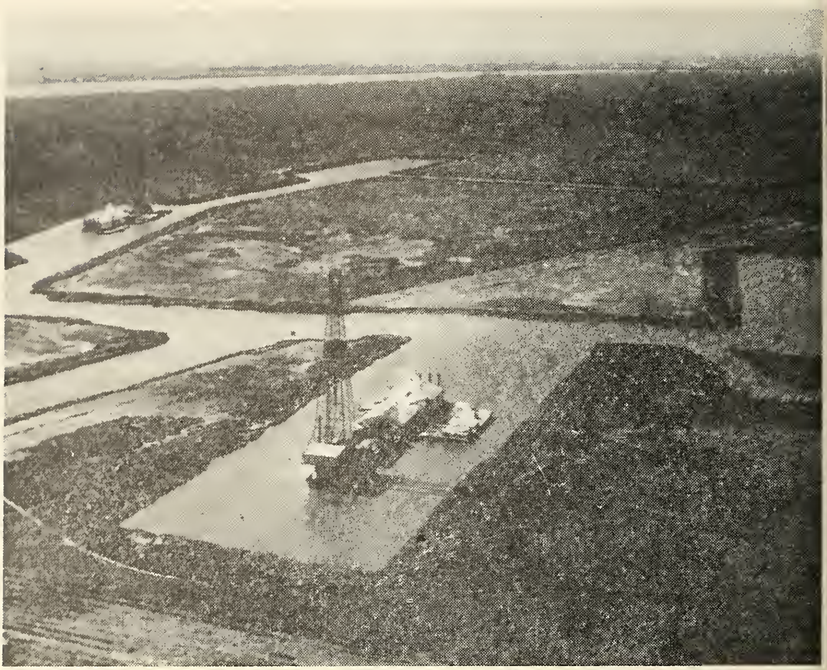
We are facing a most serious additional threat to the production of oysters in many parts of the state due to the shallowness of most of our inland or estuarian waters where water depths range from three to five feet. Oil companies are now dredging canals, allowing depths of approximately seven feet below mean



This photograph gives an idea of what occurs when an oil field is found in any area covered by water. The canals here are visible as they are in a land area. However, the same picture occurs should the field be located in a shallow water oyster area.

low water and widths of from 70 to 90 feet plus the slip area to permit drilling barges to be placed at the well location.

At the present time the method used in dredging these canals and channels is either by suction dredge or dragline. The spoils are placed either on one or both sides and in such a manner as prescribed by federal law not to raise the water bottoms more than six inches. It is the considered opinion of this department that this law is not presently being complied with in a number of cases. Since many of the canals are from 70 to 90 feet in width and seven feet in depth it can be seen the necessary volume of spoils resulting. Of course it must be understood that in some cases where normal water depths are from four to six feet, then in those areas the bottoms will be swept to allow an additional depth to maintain the approximate seven foot clearance.



Showing slips dredged at well locations with drilling rigs in position.

OYSTER LIFE CYCLE

In order to acquaint the layman with the reason why shell planting is so necessary for the perpetuation of our oyster industry, a short resume of the cycle of oyster life should be given.

The mature oyster, as we all know, has no power of locomotion, and when it once settles, whether placed by nature or by man, there it remains until removed.

Oysters in this state can be found breeeding from March through October, and to some degree even during the winter months. Breeding oysters are called "milky" because of the milky-looking fluid which they exude at that time. The milk of the female is composed of millions of minute eggs; that of the male of an incalculable number of extremely small spermatozoa. The milk is cast out into the water where the sperm of the male drifts or swims to the egg and penetrates it. This act of fertilization begins the cycle of oyster life. After fertilization takes

Drilling operations showing canals and completed wells.

place the oyster egg divides again and again, forming a ball of many tiny cells. In the course of a few hours, small vibrating hairs, known as "cilia" appear on the developing young oysters. With these cilia it keeps itself suspended while being drifted about by the winds and currents. Presently, this embryo develops a pair of tiny shells. These shells grow larger and heavier and finally the young "spat" drop to the bottom to attach themselves to some hard object and forever give up their power of moving from place to place. The young spat can best attach themselves to clean surfaces and after attachment, while still very small, they are easily smothered by sediment.

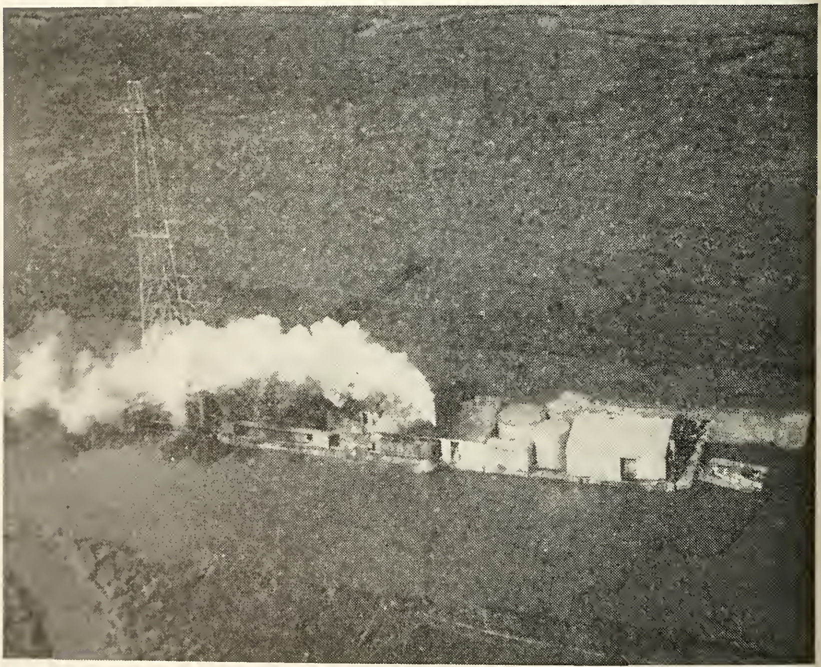
The oyster, because of its fixed position, is unable to go in search of food, and for that reason nature has so equipped this animal that it is able to obtain its food from the water in close proximity. Tiny, beating hairs or cilia in the gills of the attached oyster create water currents that carry to this animal the microscopic floating plants which form its principal food.

From the above you will note that when the young oyster spat is ready to "set" and form its permanent abode some hard, clean object should be placed on the bottom to receive the set. From experiments in Louisiana, either steamed or sun-dried oyster shells, planted on bottoms hard enough to support the shell and the additional weight of the growing oysters, have been found most desirable for this purpose. All oyster spat settling upon mud or clay soon smother and die.

CURRENTS

Since an oyster, once it has "set" must remain stationary for the remainder of its life and obtains its food supply from the water passing by, it becomes essential to the life of oysters that natural currents transporting food not be curtailed.

In addition to this danger, in the shallow Louisiana coastal waters large amounts of sediment are carried in suspension when wind and wave wash agitate the waters. During calm



Typical drilling operation showing the heavy equipment used. The use of this equipment makes it necessary for canals to be dredged in our shallow estuarian waters.

periods this sediment is always deposited in areas that lack sufficient currents. This brings us to the fact that at any point where ordinarily a current exists and oyster beds are kept clean and well fed and in good condition, if a canal is dredged which reduces the existing current velocity at any given location that area will probably silt up even though none of the original spoils reach the area. Remember this, a decrease in the velocity to one-half original will result not in the deposit of the silt load of four, but eight times the original silt deposit.

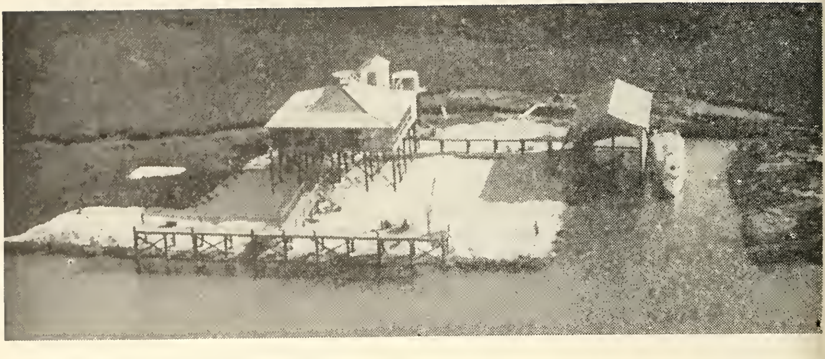
GEOPHYSICAL OPERATIONS

The method presently most often used by the various oil and geophysical companies to locate additional geological structures n Louisiana is commonly known as reflection shooting. In reflection shooting the vibrations produced by explosion of dynamite charges to the recording instrument at the surface are measured after they return from the key formations and are picked up by extremely sensitive geophones.

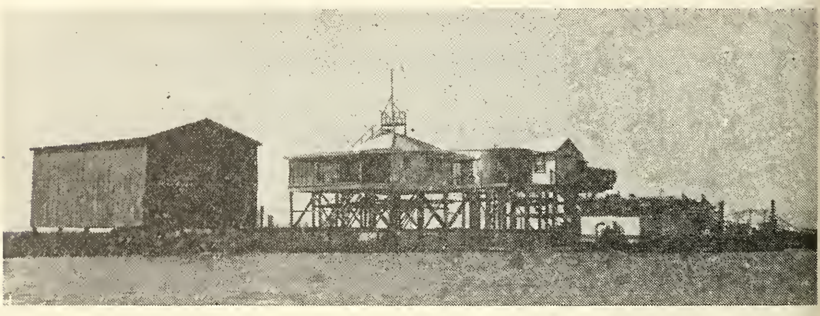
At the time of this writing there are ninety-four geophysical crews carrying on seismic exploration in the State. With each geophysical operation where explosives are used an inspector is hired by the Department of Wild Life and Fisheries and placed with each exploration crew. These agents' salary and expenses are paid by the Department, but the oil and geophysical companies are billed for this expense which is promptly refunded, which again demonstrates to what extent the various oil companies are cooperating with the State Departments in attempting o protect the wild life and seafood in this state.

These agents make written weekly reports of each day's activty giving complete data and the Department has on file the daily ecord of every exploration crew that has used explosives in the state since 1939. Each of the inspectors is furnished with sets f regulations formulated by the department and he is required o be at the location whenever, a shot is fired and see that the egulations are enforced.

Realizing that with all of this industrial activity increasing n our coastal areas and that more and more mineral deposits re being exploited there must of necessity be some deleterious ffects on our oyster industry.



New Port of Entry in Bayou Pierre where all out-of-state boats must check their oyster and shrimp cargoes before leaving the State of Louisiana. Former Port of Entry located in Grand Pass was destroyed by the 1947 hurricane.



Bay Gardene watchman's camp placed here as a base for the oyster harvester shown moored at wharf together with amphibian patrol plane. Bay Gardene Oyster Reservation is patrolled continually from this camp.

Lake Felicity Seed Oyster Reservation, watchman's camp and boat house.

The Department has set aside three oyster seed ground areas; one known as the Sister Lake Oyster Seed Ground Reservation in Terrebonne Parish; the second as the Lake Felicity Oyster Seed Ground Reservation in Terrebonne Parish; and a third as the Bay Gardene Oyster Reservation in Plaquemines Parish. We had set aside a fourth known as the Bay Du Chiene Reservation in Jefferson Parish. However, a producing oil field is now located in this bay and no shells have been planted there in recent years.

In all of the other reservations, however, camps have been built and watchmen are retained annually so that all of the young oysters, both oysters growing on planted shells, or seed oysters taken from the more inaccessible reefs, may be guarded until the oystermen are allowed to remove these State-grown oysters under departmental supervision and regulations.

All moneys used by the State for these seed ground developments are obtained from royalties from those industries that take our dead shell reefs and use them either for road building, chicken feed or for the extraction of lime so necessary in the manufacture of chemicals and other products. The equity of this is immediately apparent as oyster shells furnish the money to produce additional live oysters which in turn produce more shells.

LEGISLATIVE RECOMMENDATIONS

The inescapable result of the foregoing, unless adequate measures are promptly taken, will be the endless continuation of the present decline of the oyster industry of this State.

IT IS SUBMITTED that in order to safeguard the State's ownership of the waterbottoms encompassing not only the State controlled natural reefs, but also privately leased bottoms, the 1952 Session of the Legislature should enact legislation to accomplish the following purposes:—

1. Secure and set aside a fund to be obtained from oil, gas and mineral severance taxes and from bonuses and delay rentals paid under State mineral leases, to rehabilitate or establish new oyster reefs in localities where future mineral and/or seismographic operations appear to be unlikely, and to compensate oyster fishermen for damages resulting from mineral and/or seismographic operations.

2. Create and establish a Board with full power to administer said fund, to ascertain and determine the extent of damages claimed to have resulted from mineral and/or seismographic operations. To pay just compensation to each claimant who may have proved to the satisfaction of said Board damages resulting from mineral and/or seismographic operations.

RULES GOVERNING SEISMIC EXPLORATION IN THE STATE OF LOUISIANA

In order to prevent the destruction of, or injury to the oysters, fish and other aquatic life, or other natural resources of the state of Louisiana, and pursuant to the authority conferred by Act 127 of 1912, as amended, the following rules shall from and after the first day of January, 1952, govern any exploration work involving the discharge of explosives in the State of Louisiana.

(1) The commissioner of the Department of Wild Life and Fisheries will designate when, where and how such exploration work shall be conducted under the following rules and regulations. The supervision of this work is under the Division of Oysters and Water Bottoms.

(2) A permit from the Department of Wild Life and Fisheries bearing the signatures of the commissioner, the director of the Division of Oysters and Water Bottoms and the chief geophysical inspector is required for all seismic exploration work in the State of Louisiana.

(3) No seismic exploration shall be started without a permit issued by the commissioner of the Department of Wild Life and Fisheries and all such work must be carried out in such manner as may be approved by the said commissioner.

(4) Applications for permits for such exploration work must be filed with the Division of Oysters and Water Bottoms at least ten (10) days before issuance of permits on forms provided by the Division of Oysters and Water Bottoms of the Department of Wild Life and Fisheries, and must be accompanied in triplicate by:

(A) A detailed map showing the exact area in which the geophysical operations are to be conducted, such area to be shown, where possible, by reference to an established landmark and showing general location of shooting lines (general location of shooting lines for water area only).

(B) A permit from the State Mineral Board, in cases where the area under investigation is owned by the State of Louisiana.

(C) Certification of assent from lessor, where area under investigation is leased to other than the person or firm conducting the exploration (necessary only for public-owned lands).

(D) Statement of type of work planned (reflection, refraction, etc.).

(See Appendix B for additional requirements to operate in state)

(5) Permits are limited to a period of four months from date of issue, but may be renewed for additional four-month periods at the discretion of the Commissioner of Wild Life and Fisheries.

(6) In general, permits will be issued only for an area not greater than four (4) townships and ranges (a total of sixteen (16) townships), and no seismic crew shall work outside the area as decribed in the permit.

(7) Each seismic exploration crew working in the State of Louisiana will always be accompanied by a conservation agent unless written exception has been granted by the commissioner. When a crew employs more than one shooting crew and the crews are at such a distance apart that it is impossible for the conservation agent to travel from one to the other in time to observe the shots of each crew, it will be required that an agent be assigned to each shooting component of the crew.

(8) Daily reports on such exploration work shall be filed with the Division of Oysters and Water Bottoms of the Department of Wild Life and Fisheries at the end of each week, on forms provided by the department. A separate report must be made for each day whether or not shooting is in

progress. These reports must furnish complete information as indicated by the report form and must be signed by the party chief and by the conservation agent.

(9) Operators shall notify the Division of Oysters and Water Bottoms of the Department of Wild Life and Fisheries of beginning, of interruption, and of cessation of work in any area, and shall keep the department informed of name and address of party chief, and location and movements of the crew or quarterboat.

(10) All pipe used in geophysical operations must be removed to at least six feet below the surface of the ground or six feet below the bottom in water areas.

(11) All holes drilled in geophysical operations in land areas must be filled by the persons or agency drilling these holes before leaving the location.

(12) No explosives shall be discharged within 250 feet of any oyster reef or bed, including any state-owned natural reefs, without written permission signed by the owner of the reef or bed, approved by the commissioner of Wild Life and Fisheries and the director of the Division of Oysters and Water Bottoms.

(13) In the interpretation of these rules and regulations, the dividing line between north and south Louisiana will be latitude 31° north. The area lying south of this latitude is considered south Louisiana.

(14) (A) Minimum required depths of charges in south Louisiana and in all water areas shall be as follows:

(a)	5 lbs. or less	20 feet
	up to 20 lbs.	40 feet
	up to 30 lbs.	50 feet
	up to 40 lbs.	60 feet
	up to 50 lbs.	70 feet

(b) No part of the charge shall be above the minimum required depth.

(c) These minimum required depths shall not apply to trial charges and charges for determining condition of the weathering layer: provided that such charges are not over five (5) pounds, and not fired oftener than absolutely necessary.

(B) Minimum required depths of charges in north Louisiana with the exception of water areas shall be as follows:

5 lbs. or less	15 feet
up to 20 lbs.	20 feet
up to 30 lbs.	25 feet
up to 40 lbs.	30 feet
up to 50 lbs.	35 feet

(C) The placing of explosive charges on the bottoms of the waters of the Gulf of Mexico, Mississippi Sound, Breton Sound, Chandeleur Sound and Lake Borgne is prohibited. All such charges must be suspended and detonated at a point not below the level midway between the surface of the water and the substratum underlying such water; or detonated above the surface of the water.

15) When more than one shot is fired in the same hole and there is any reasonable doubt in the mind of either the conservation agent or the field manager of the party as to the legal depth of the hole after the shot is fired, the hole will be measured for depth before reloading to ascertain that it is the required depth in accordance with our table of charges and depth.

16) Persistent gas and water spouts caused by drilling or shooting operations of seismic crews in water areas will be stopped as soon as possible after they occur.

17) Charges in excess of fifty (50) pounds shall not be used except pursuant to express written authorization from the commissioner of Wild Life and Fisheries. Requests for the use of such charges must be made in writing, giving the reasons why such charges are needed, the size of charges to be used, and the depth at which they are to be buried. In water areas the request must be accompanied by a map showing the approximate shot point locations. Such requests should be addressed to the Division of Oysters and Water Bottoms.

18) Should multiple charges be used the total amount of explosion should not exceed fifty (50) pounds without special permission from the commissioner of Wild Life and Fisheries.

(19) No shooting operation shall be carried out except in the presence of an agent of the Department of Wild Life and Fisheries.

(20) Agents assigned to seismic crews are under the supervision of the director of the Division of Oysters and Water Bottoms of the Department of Wild Life and Fisheries.

(A) The supervisor, on request, will have access to all records, such as shot point maps, shooting logs and tracings, but only to the extent necessary to determine that all protective requirements have been complied with.

(B) The interpretation of these rules and regulations by the supervisor will be accepted by the seismic operator and the conservation agent.

(C) The party chief will instruct the members of his party as to these rules and regulations, and to the duty and authority of the supervisor of the Division of Oysters and Water Bottoms of the Department of Wild Life and Fisheries and the conservation agent.

(D) The party chief will assist the conservation agent to fill out the required form by furnishing all necessary data.

(21) (A) A geophysical supervision fee in the amount of $250.00 per month for each party to which a conservation agent is assigned in accordance with these rules and regulations will be paid by the exploration companies direct to the Department of Wild Life and Fisheries on or before the 20th of each month. If seismic operations are discontinued during the period 16th to 30th, a full fee in that amount must be paid. If operations are discontinued during the period 1st to 15th a half-month's fee must be paid. The Department of Wild Life and Fisheries will pay the agents from its office on the 30th of each month for this supervision.

(B) The agents will be reimbursed by the exploration companies for expenses incurred traveling to the job and returning home after completion of the work. If this travel is performed in the agent's personal automobile, he will be reimbursed at the rate of six (6) cents a mile. Should an agent desire to return to his home in an intermediate-lay-off-time between operations, he may do so at his own expense. In the event of a transfer of agents, travel expenses will be borne by the agents involved in the transfer, unless the transfer is made at the specific request of the exploration company.

(C) When an agent is quartered on a boat working in the coastal waters of Louisiana, or quartered on a houseboat, an expense allowance of $40.00 per month will be paid in addition to room and board. Should an agent return daily to his home, no expenses will be paid. When the seismic party is not operating from a houseboat and the agent is required to reside away from his home, his allowable for room and board shall be $75.00 per month. Party chiefs will pay agent's expenses direct and not through the Department of Wild Life and Fisheries.

(22) The conservation agent has the right to stop any particular shooting, if, in his opinion, it will violate the above rules and regulations, but does not have the authority to shut down the entire exploration work.

(23) If, in the opinion of the conservation agent, such violations continue, he will immediately contact the Department of Wild Life and Fisheries supervisor, and the members of the exploration party will assist him to do this with all the facilities at their disposal.

(24) The party chief will furnish the department supervisor with transportation facilities to enable him to visit the working area, if requested.

(25) The party chief is required to notify the Division of Oysters and Water Bottoms of the Department of Wild Life and Fisheries office immediately if the conservation agent is not on the job, and will notify the department supervisor if it should be necessary to relieve the agent at any time. The department supervisor will arrange relief for the agent.

(26) No conservation agent shall have the right to release any operator from the obligations imposed by these rules and regulations. Exceptions may be granted by the Commis-

sioner of Wild Life and Fisheries only, after written application setting forth reasons for exception. The release, signed by the commissioner, will designate the particular area and rule affected and the procedure to be followed in lieu of the established rule.

(27) All operators conducting seismic operations shall use reasonable precaution in accordance with approved and accepted methods to prevent destruction of, or injury to, fish, oysters, shrimp and other aquatic life, or other natural resources of the State of Louisiana.

(28) Operators shall furnish to the Department of Wild Life and Fisheries a surety bond with a surety company authorized to do business in the State of Louisiana in the full sum of twenty-five thousand ($25,000.00) dollars when using more than one seismic crew in the field, or five thousand ($5,000.00) dollars when operating with only one crew. Bond forms may be obtained from the Division of Oysters and Water Bottoms of the Department of Wild Life and Fisheries.

(29) Any violation of these or any other valid rules promulgated by the Department of Wild Life and Fisheries for the regulation of seismic operations in the state, or the refusal of any operator or its employees to comply fully with all orders and requirements which may be made by the Department of Wild Life and Fisheries at the time the exploration is conducted, or any attempt to unduly influence any conservation agent from abstaining from the enforcement of these regulations shall constitute preemptory cause for the revocation of any permit which may theretofore have been issued and may mean the barring of the party chief involved from future operations in this state.

(30) These rules and regulations supersede all other rules and regulations issued prior to this date and are subject to change at the discretion of the commissioner of Wild Life and Fisheries.

APPENDIX A

Additional regulations and instructions for all party chiefs and conservation agents assigned to seismic crews.

(1) The conservation agent will be constantly present during the shooting operations of the party to which he is assigned.

(2) The conservation agent will be present on the boat from which shotholes are loaded and, by means of the loading pole, check the hole depth. (By hole depth is meant the depth of hole from the surface of the ground, not the surface of the water, to the top of the last stick of dynamite put in the hole.) This distance must never be less than twenty feet, in accordance with Section 14-A(a) of Rules Governing Seismic Exploration.

(3) The conservation agent will test around the shothole and ascertain for himself that the shothole is drilled through no oyster bed and that the shothole is at least 250 feet from any oyster bed. Some oyster beds are not marked.

(4) The conservation agent will keep a record of each shothole and fill out this record as required. This record is a daily report and must also be filled out for days when no work is done.

(5) This record will be sent at the end of the week to the Department of Wild Life and Fisheries, Division of Oysters and Water Bottoms, 126 Civil Courts Building, New Orleans, Louisiana, and must be personally signed by the party chief and the conservation agent.

(6) The party chief will furnish only such information to the conservation agent as is required to fill out the necessary daily reports. Should the Department of Wild Life and Fisheries wish to secure any other information, it will furnish the party chief with a written request, signed by the commissioner of the Department of Wild Life and Fisheries.

(7) No shooting will be allowed except during daylight hours so that the conservation agent may observe the results of each shot.

(8) After the shotpipe is pulled, the conservation agent will see that the discarded pipe is not thrown into the water but is thrown on dry land.

(9) The conservation agent will see that unused shotholes are lighted at night and marked by day according to navigation rules of the U. S. Corps of Engineers. The same applies to the drill boat or any other boat which stays overnight in an open water area.

(10) The conservation agent assigned to a seismic crew will not assume the duties of a game warden, but will report to the Department of Wild Life and Fisheries the conditions of wild life and the game violations as he sees them in the regular course of his duties.

(11) The conservation agent will immediately notify the Department of Wild Life and Fisheries of any change of address of the seismic crew, change of his own address, change of location of the field office or quarterboat.

(12) All correspondence and reports will be addressed to the Department of Wild Life and Fisheries, Division of Oysters and Water Bottoms, New Orleans 16, Louisiana, Telephone MAgnolia 1981.

APPENDIX B

The following departments require permits to conduct geophysical operations in the State of Louisiana:

(1) A permit from the Department of Wild Life and Fisheries for all seismic exploration work in the State of Louisiana is required. Supervision is handled through the Division of Oysters and Water Bottoms of the Department of Wild Life and Fisheries at New Orleans, and permit must bear the signature of the commissioner of Wild Life and Fisheries, the director of the Division of Oysters and Water Bottoms, and the geophysical inspector of the Division of Oysters and Water Bottoms.

(2) A permit from the Louisiana Geological Survey is required to conduct any geophysical or geological exploration on state-owned lands or water bottoms. Said permit must bear the signature of the commissioner of Conservation and the state geologist. Application for permit should be made to the Department of Conservation, Louisiana Geological Survey, Baton Rouge, Louisiana.

(3) A permit from the Department of Highways is required for geophysical operations along the public highways of the state. If public highways are not regularly maintained by the Department of Highways, it shall be sufficient to procure the consent of the Policy Jury of the parish in which said public highway is located. Permits are issued by the

Department of Highways, Baton Rouge, Louisiana. (Explosives must not be discharged within the right-of-way of any highway.)

(4) A permit from the Department of State Police is necessary for the transportation of explosives over the highways of Louisiana. Such permits are issued by the Department of State Police, Baton Rouge, Louisiana.

(5) A permit from the War Department is necessary when exploration work is to be conducted in navigable streams. Applications for such permits should be submitted to the District Engineer, United States Engineers' Office—New Orleans District, Foot of Prytania Street, New Orleans, Louisiana; Vicksburg District, Vicksburg, Mississippi; or Galveston District Office at Galveston, Texas.

REPORT ON SEED OYSTER RESERVATIONS AND FUTURE PROGRAM

LESTER L. WALTERS, *Biologist*

Seed oyster reservations set aside by the state serve a dual purpose. One purpose is to increase the promulgation of seed oysters. The other purpose is to absorb a portion of the drain on the natural reefs. Presently, three seed oyster reservations are undergoing continual development. These areas are Sister Lake, Lake Felicity and Bay Gardene.

A number of shell and oyster plantings were made during 1950. A clam shell planting at Sister Lake consisted of 34,620 barrels. An additional 17,042 barrels of clam shell were planted in Lake Felicity. These plantings were made at a cost of $29,447.68 at a contractual cost of fifty-seven cents (57¢) per barrel. The oyster harvester records show an estimated 14,475 barrels of seed oysters transplanted from Bay Craba and adjacent areas to the Bay Gardene reservation. Canning plants, at no cost to the State of Louisiana, transplanted, by contractual arrangement, 12,335 barrels of seed oysters from adjacent areas to Bay Gardene.

During 1951, 40,057 barrels of oyster shell were planted by oyster luggers in Sister Lake at a contractual cost of sixty-five cents (65¢) per barrel, and 10,000 barrels of oyster shell were

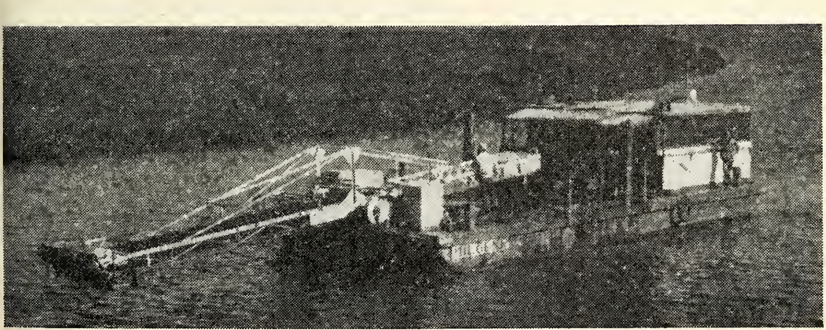
Load of seed oysters dredged from east of Mississippi river.

likewise planted in Lake Felicity at a contractual cost of sixty-three cents (63¢) per barrel. The total cost for these plantings was $32,337.05. The Jurisich oyster harvester operated five and one-half months and transplanted 10,650 barrels of seed oysters to Bay Gardene. These oysters were obtained from the less accessible natural reef areas between Mozambique Point and Stone Island. The extended non-operational period of the oyster harvester was due to personnel shortages, extensive repairs and modifications. The annual operational expenditures on the oyster harvester were $16,286.19. On the annual basis the cost per barrel of oysters transplanted did not compare favorably with contractual shell plantings; however, during the operational period costs of operation did compare favorably with contractual shell plantings.

Sufficient information has been obtained on the seed oyster reservations to permit indicative comparisons in the promulgation of seed oysters. Sister Lake shows greatest promise in terms of oyster production. Bay Gardene appears to produce seed oysters of higher quality, but thus far the indications are that fewer oysters will be produced per given area. Lake Felicity shell plantings to date have been unsuccessful. This is considered due to the abundance of conchs. Future plantings in Lake Felicity should be on a reduced scale and on an experimental basis until the proper conditions for successful plantings are learned and more clearly understood.

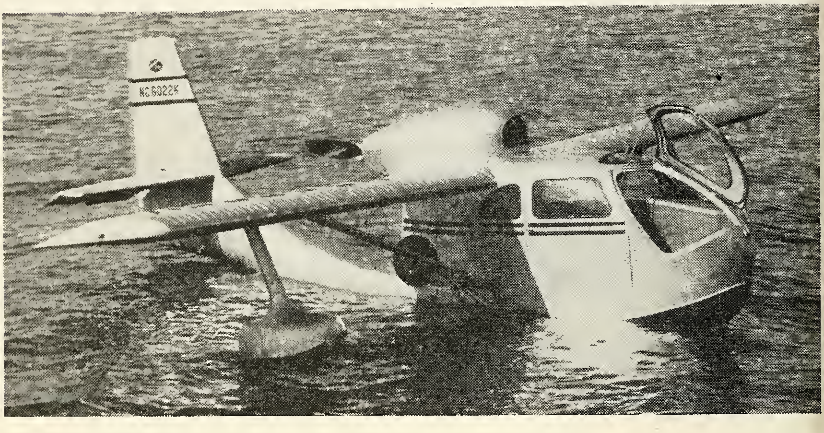
During the 1952-53 marketing period, barring catastrophic mortalities, the seed oyster reservations can be expected to produce 250,000 barrels of oysters. From Sister Lake approximately 200,000 barrels of sizable seed oysters will be available. It should be remembered this reservation was dredged extensively during 1948. Approximately 100,000 barrels of shell have been planted subsequent to the 1948 opening. On this basis it is considered logical to expect a yield of at least two barrels of seed oysters per barrel of planted shell. Such returns justify the expenditures for shell plantings in this reservation.

At Bay Gardene the indications are an estimated 50,000 barrels of seed oysters will be available during the 1952-53 season. This estimate includes the natural reef oysters in the eastern half of the reservation which is now under development. Nearly 37,000 barrels of seed oysters have been transplanted to this reservation subsequent to its initial development. The anticipated low production ratio in this reservation is due to several factors. Transplanted oysters for the most part were placed on virgin water bottoms in an effort to increase the oyster growing acreage resulting in an unknown percentage of oysters being buried in

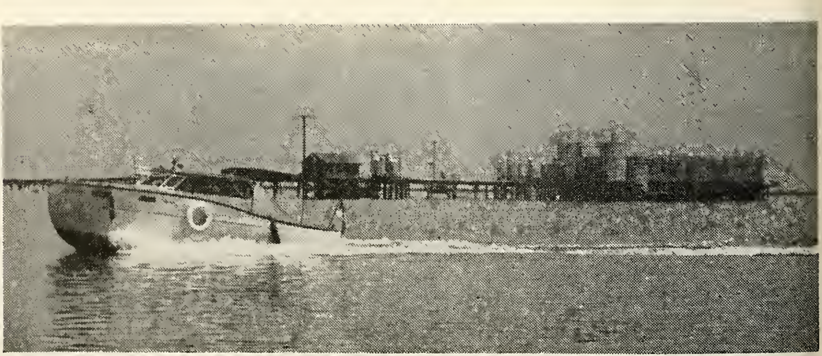


Oyster Harvester Milgene showing rake and conveyor.

Patrol boat "Captain Sandras" used for patrolling oyster areas.



Seabee amphibian attached to Oyster Division used for patrol and inspection purposes.



Coastal Waste Inspector patrolling oil producing area.

the mud. Approximately one-third of the volume of transplanted oysters was possibly overestimated. No shell plantings were made at Bay Gardene. Usually, successful shell plantings in Louisiana result in the highest volume production ratios, possibly three or four to one. Keeping in mind this is the most recent of the seed oyster reservations it is assumed the production ratios can be greatly improved.

Lake Felicity will not be opened during the 1952-53 season. This is due to the absence of a sufficient volume of seed oysters. As previously mentioned, Lake Felicity has proved to be the least successful of the seed oyster reservations. Coincident with these results less biological information is available on this lake than the others. An intensified effort in the collection of additional biological information on Lake Felicity might result in a successful development program. Should this prove to be true it would be of paramount importance due to the similarity of the problems prevailing in many other oyster growing regions in Louisiana.

In general, it is evident the state sponsored seed oyster reservation program can be considered successful. Louisiana oystermen can expect 250,000 barrels of oysters from the seed oyster reservations during the 1952-53 season.

FUTURE PLANS

For the most part past biological programs have been significantly academic. Such programs have resulted primarily in the collection of diversified and valuable information. A number of investigators have presented evaluations of their findings. These evaluations should not be ignored, but tested by means of practical application.

The future biological program should determine the validity of the evaluations set forth by these investigators in terms of developmental costs and oyster production. This has not been done, the evidence of which is substanciated by the absence of a permanent and accurate past history of any state supervised oyster growing water bottoms. Therefore, evaluations of oyster growing regions are commensurate with abstract terms such as suitable, unsuitable, successful, unsuccessful, good or bad, etc. Value of oyster growing water bottoms could more practically be evaluated by the production of oysters per unit of area. Fortunately, the seed oyster reservations are situated in such a manner to permit introductory phases of this method of evaluation.

The problem of producing the necessary volume of seed oysters to meet the requirements of oystermen has been rapidly advancing to the critical stage. An intensified effort should be made to assist nature's attempt to meet the demands of the oyster industry. Introductory survey work and should be undertaken during the next biennium to eventually permit annual shell plantings of at least 500,000 barrels. This would be a positive approach to oyster promulgation.

A future biological program should provide additional funds, personnel and equipment. An extensive review of causes of oyster mortality was completed in August, 1950. Introductory researches have been completed on other probable causes of oyster mortality. It is doubtful these researches can be considered exhaustive. Continued investigations in this direction should be forthcoming. Investigations of this kind require experienced and highly technical personnel in addition to the necessary equipment. Unfortunately a critical physiological laboratory for oyster research has not been available in Louisiana. This problem could in part be met by the provision of a fully equipped biological research vessel designed to permit its transport to nearly all oyster growing regions. Through such an approach the collection of more conclusive factual information could be anticipated.

ETIOLOGICAL STUDIES ON OYSTER MORTALITY

I. Nematopsis ostrearum Prytherch 1940 (Sporozoa : Porosporidae)[1]

By

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Louis A. Bregan

Louisiana Department of Wild Life and Fisheries
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ABSTRACT

Oysters from the major producing area of Louisiana were found to be 100% infected with the gregarine parasite *Nematopsis ostrearum;* those from a check station in Pencacola Bay, Florida, were found to be 95.1% infected. In Louisiana, the population of *N. ostrearum* was found to be higher in the area east of the Mississippi River. *N. ostrearum* infections in oysters increased significantly during summer months in areas of relatively low oyster mortality. It was concluded on indirect and negative evidence that *N. ostrearum* was not a controlling factor responsible for the condition of oysters or for their extensive mortalities in Louisiana waters.

INTRODUCTION

During extensive investigations on causes of oyster mortalities in Louisiana coastal waters, the authors studied the intensity and distribution of *Nematopsis ostrearum* Prytherch in its secondary host, the oyster. This phase of our etiological study is concerned only with the parasite *N. ostrearum.*

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[1] Contribution Number 5 from the Contractual Research Program, Division of Oysters and Water Bottoms, Louisiana Department of Wild Life and Fisheries.

[2] Present Address: Department of Biology, University of the South, Sewanee, Tennessee.

Both Prytherch (1938) and Kudo (1946) have described the life cycle of the oyster parasite which Prytherch later (1940) described as a new species, *N. ostrearum,* and which we consider to be the species observed in this study. Sprague (1949), recognizing two species, described *N. prytherchi,* which occurs simultaneously with *N. ostrearum* in the secondary host but which is concentrated in the gills. With this latter species we are not concerned in this study.

Systematic studies were made on oysters from selected locations in Louisiana and Florida. The incidence and degree of infection were determined and the results were compared with mortality and with the Index of Condition determinations.

MATERIALS AND METHODS

Twenty-one stations were established in Louisiana and one at Pensacola, Florida.[3] The stations were sampled at regular intervals in 1947 and 1948 and sporadic checks were made in 1949. Because of the extent of the territory, an amphibious plane was used to transport a standard sample of 25 oysters from the collection point to the laboratory for immediate analysis and examination.

The technique employed for the miscroscopic examination of the tissue was as follows. A square centimeter of mantle tissue, ventrally adjacent to the adductor muscle, was dissected from each of ten oysters, and each sample tissue was then individually mounted in a 20% NaOH solution between two firmly compressed microscopic slides. After each tissue was partially digested (10 minutes), it was studied under the low power of a compound microscope equipped with a Whipple Ocular Micrometer. By use of the mechanical stage, ten microscope fields were examined and the number of cysts included in the micrometer field were counted and recorded. At least ten oysters were thus examined, one sample having been taken from each. The results were averaged to give the intensity of infection.

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[3] Laboratory of the U. S. Fish and Wildlife Service, where space was made available to the State of Louisiana for the purpose of conducting independent investigations.

The following arbitrary values were selected on the basis of accumulated experience in order to facilitate an understanding of the comparative degree of infection that was found to be present in Louisiana and Florida oysters:

0–19 cysts per W-M field	very light
20–39 cysts per W-M field	light
40–59 cysts per W-M field	medium
60–79 cysts per W-M field	heavy
80–99 or more per W-M field	very heavy.

The same oysters were used for measuring the Condition Index (Hopkins, 1938). The Mortality Index for the respective stations in Louisiana was determined over a period of 30 months by sampling with a standardized procedure, expressed in per cent. This procedure consisted of tonging or dredging oysters at random at a given station until a one-half standard oyster bushel measure was obtained. Mortality was determined by counting the recently dead oysters. Normally the valves of the oyster are held together by an elastic hinge ligament, but at death the two valves stand or "gape" open, the oyster meats disappear quickly, so that all that remains is two hinged valves, which are called "boxes." The live oysters were separated from the "boxes." The mortality results at the Pensacola station were determined from the control tanks of other oyster experiments. A total of 1600 oysters was used.

RESULTS

The miscroscopic examination of 723 live oysters from 30 locations in Louisiana coastal waters showed a 100% infection; no dead oysters were examined. In Florida, 260 live oysters were examined, 95.1% being infected; of 495 dead oysters examined, 94.2% had been infected.

The results of the Louisiana examinations, the Condition Index determinations, and the mortality percentages are summarized in Table I. The results of the Florida investigations are summarized in Table II. For clarity in discussion, the results in Table I are arranged and summarized according to the natural drainage areas of the oyster-growing regions (Table III). Table IV contains the results from the studies of all Louisiana stations.

Our data show no correlation of *N. ostrearum* infection with salinity, dissolved oxygen, and hydrogen-ion concentration of the water. These factors were carefully checked from the tank experiments conducted at the Pensacola Laboratory.

TABLE I

Infections of Florida Oysters with *Nematopsis ostrearum*, Compared with the Indices of Condition and Mortality

Station Number	Location	Date of Sampling (month-year)	Av. No. Cysts per Sample	Condition Index per Sample	Mortality Index per Station (Total)	Comparative Intensity of Infection
1	Cabbage Reef	10–47	61.1	—		Heavy
		3–48	41.2	8.6	5.5	Medium
		7–48	125.5	6.4		Very Heavy
		12–48	57.9	5.7		Medium
2	Bayou Pierre	10–47	51.2	—		Medium
		3–48	42.0	8.1	30.5	Medium
		7–48	122.4	7.0		Very Heavy
		12–48	66.7	4.7		Heavy
3	Grand Pass	10–47	75.1	—		Heavy
		3–48	48.6	9.6	9.5	Medium
		7–48	98.7	6.3		Very Heavy
		12–48	31.9	4.8		Light
4	Black Bay					
		3–48	75.2	3.8	5.8	Heavy
		7–48	69.7	7.8		Heavy
		12–48	32.6	4.9		Light
6	American Bay	10–47	41.2	—	6.6	Medium
		3–48	64.5	5.5		Heavy
		7–48	63.6	8.2		Heavy
		12–48	116.1	3.3		Very Heavy
7	California Bay	10–47	40.6	—	11.5	Medium
		3–48	31.0	4.4		Light
		7–48	123.8	8.3		Very Heavy
		12–48	83.7	3.9		Very Heavy
8	Quarantine Bay	10–47	31.0	—	25.2	Light
		3–48	36.8	5.7		Light
		7–48	79.6	6.9		Heavy
		12–48	33.3	3.9		Light
9	Grand Bay	10–47	17.2	—	43.5	Very Light
		3–48	15.7	9.5		Very Light
		7–48	165.1	8.4		Very Light
		12–48	30.1	6.3		Light
10	Sandy Point	10–47	42.1	—	21.8	Medium
		3–48	52.0	10.1		Medium
		7–48	41.0	3.3		Medium
		12–48	32.2	7.4		Light
11	Skipjack Bay	10–47	18.0	—	39.0	Very Light
		3–48	—	12.2		
		7–48	21.1	4.1		Light
		12–48	21.3	7.7		Light

TABLE I—Continued

Station Number	Location	Date of Sampling (month-year)	Av. No. Cysts per Sample	Condition Index per Sample	Mortality Index per Station (Total)	Comparative Intensity of Infection
13	Bayou Scofield	10–47	21.1	—		Light
		3–48	24.2	12.2	42.0	Light
		7–48	42.5	5.8		Medium
		12–48	45.1	8.9		Medium
16	Bastian Bay	10–47	30.5	—	80.1	Light
		3–48	29.6	12.8		Light
		7–48	24.1	6.0		Light
		12–48	28.7	10.6		Light
18	Rattlesnake Bayou	10–47	20.7	—	32.8	Light
		3–48	—	—		
		7–48	31.2	6.4		Light
		12–48	22.7	6.5		Light
20	St. Mary's Point	10–47	—	—		
		3–48	31.8	7.2	23.3	Light
		7–48	36.2	4.0		Light
		12–48	54.9	4.3		Medium
21	Bassa-Bassa Bay	10–47	—	—		
		3–48	17.9	8.8	36.0	Very Light
		7–48	25.3	6.2		Light
		12–48	17.8	9.0		Very Light
22	Lower Barataria	10–47	26.7	—	58.1	Light
		3–48	33.4	9.6		Light
		7–48	52.6	9.2		Medium
		12–48	88.6	7.1		Very Heavy
23	Lake Felicity	10–47	—	—		
		3–48	43.2	9.1	22.6	Medium
		7–48	58.0	4.7		Medium
		12–48	15.0	5.8		Very Light
23A	Lake Pelto	10–47	32.5	—		Light
		3–48	34.1	7.4	—	Light
		7–48	44.8	4.9		Medium
		12–48	15.4	6.4		Very Light
24	Sister Lake	10–47	18.2	—	8.4	Very Light
		3–48	13.3	5.5		Very Light
		7–48	71.3	5.0		Heavy
		12–48	10.4	5.3		Very Light
25	Four League Bay	10–47	—	—		
		3–48	22.5	7.4		Light
		7–48	33.5	4.8	—	Light
		12–48	21.6	5.5		Light
25A	Oyster Bayou	10–47	—	—		
		3–48	8.8	7.6	9.6	Very Light
		7–48	42.6	6.7		Medium
		12–48	38.1	5.5		Light

TABLE II

Infections of Florida Oysters with Nematopsis ostrearum, Compared with Condition Index and Mortality from Controlled Experiments at the Pensacola Laboratory (20 Oysters Used Each Month).

Month and Year	Average Number of Cysts	Index of Condition	Mortality Monthly Av.	Intensity of Infection
4–48	19.4	5.14	—	Light
5–48	—	6.18	3.5	—
6–48	10.5	4.26	16.8	Very Light
7–48	41.2	3.71	30.4	Medium
8–48	64.1	3.21	21.7	Heavy
9–48	26.0	2.48	13.7	Light
10–48	29.4	2.61	17.3	Light
11–48	46.3	2.48	29.1	Medium
12–48	—	—	17.8	—
1–49	112.3	2.34	8.0	Very Heavy
2–49	21.1	2.95	3.4	Light
3–49	22.8	4.04	2.2	Light
4–49	25.9	4.98	2.2	Light

TABLE III

Compilation of Results by Natural Drainage Areas of Louisiana; Data from Table I

Area	Month and Year	Av. No. Cysts per Sample	Index of Condition	Intensity of Infection
I	10–47	62.5	—	Heavy
	3–48	43.9	8.8	Medium
	7–48	115.5	6.6	Very Heavy
	12–48	52.2	5.0	Medium
II	10–47	32.5	—	Light
	3–48	44.6	5.8	Medium
	7–48	100.3	7.9	Very Heavy
	12–48	59.1	4.5	Medium
III	10–47	26.5	—	Light
	3–48	31.5	10.4	Light
	7–48	34.2	5.6	Light
	12–48	38.9	7.7	Light
IV	10–47	32.5	—	Light
	3–48	38.6	8.2	Light
	7–48	51.4	4.8	Medium
	12–48	15.2	6.1	Very Light
V	10–47	18.2	—	Very Light
	3–48	14.9	6.8	Very Light
	7–48	49.1	5.5	Medium
	12–48	23.4	5.5	Light

TABLE IV

Total Mortality and Infection Results from 30 Louisiana Stations Grouped by Natural Drainage Areas

Area	Total Oysters Examined	Infection	Mortality	Intensity
I	171	58.5	15.2	Medium
II	160	56.3	18.5	Medium
III	217	30.9	41.6	Light
IV	75	29.3	22.6	Light
V	100	26.7	9.0	Light

DISCUSSION

Largely because of Prytherch's work, *N. ostrearum* was suspected of being one of the possible causes of poor condition and mortality of oysters. However, our data do not support the application of Prytherch's view of Louisiana oysters.

The condition or quality of oyster meats is determined by several factors, one of the most important being seasonal differences in temperature and the reproductive cycle. This Condition Index is expressed by the equation:

$$\text{C. I.} = \frac{100 \text{ X dry wt. (gr.)}}{\text{Vol. of Shell Cavity (cc)}}$$

On recovery from spawning, oysters in Area II (Table III) attained their peak of condition in July 1948 when the intensity of encysted *N. ostrearum* spores attained a simultaneous maximum. However, this was not the case in Areas I, III, IV, and V, where the condition of the oysters followed the usual seasonal pattern (C. I. high in winter and spring, low in summer) and where the intensity of *N. ostrearum* still reached its peak in July, except in Area III. Oysters from stations 7, 10, 16, 18, 22, 24, 25, and 25A showed good condition at the maximum of infection (Table I).

At Pensacola, the oysters examined came from among those held in concrete tanks. On examination of Table II, it will be seen that the same lack of correspondence between the intensity of *N. ostrearum* and Index of Condition prevails.

There have been two known cases where *N. ostrearum* has been reported as a causative agent for oyster mortalities (Prytherch, 1940; Southern Reporter, 1944). The inference has been drawn that heavy infection results in the physical impairment of the ostia or vascular system or of both, this resulting in debilitation and finally death. From our observations, occasionally there are extremely heavy infections that are detrimental to the health of the organism. However, because Areas I and II, both low mortality areas, show a significantly higher infection than does Area III, a high mortality area, it appears logical to conclude that the extensive mortalities can not be attributed to this organism (Table IV). Station 16 (Table I) clearly illustrates this point. Of the 295 dead oyster meats recovered from the experimental tanks at the Pensacola Laboratory, only four oysters had an abnormally high incidence of infection. The remaining oysters averaged 8.2 cysts per field, with a maximum of 132 and a minimum of zero. From these results it is apparent that there are other factors that cause the differential mortality.

Sprague (personal communication) has stated that "experimentally produced infections incomparably more intense than anything seen in nature, using the two [*Nematopsis*] species separately, do not show conclusively that either one is particularly harmful to the oyster." Engle (1946) stated that no correlation could be found between distribution and intensity of infection of *Nematopsis* with poor condition and mortality in oysters of upper Chesapeake Bay.

The fact that histolysis surrounding spores was not observed in any infected tissues is additional evidence that eliminates *N. ostrearum* as a factor responsible for poor quality or mortality of oysters.

The spores found in the tissues are inactive, i. e., they do not reproduce within the body of the oyster. The outer wall of the cyst is laid down as a result of the tissue reaction of the host organism. There is no evidence of a continued irritation response. This, of course, does not eliminate the potential pathogenic effort which might result from migrating larvae before phagocytosis occurs.

It is significant, however, that the intensity of infection increases during the summer months. In contrast to Area III, Areas I, II, IV, and V of Louisiana and the Pensacola Station illustrate this seasonal variation. No positive reasons for the variation can be offered other than ecological differences from one area to another. One could postulate variation in intensity as a function of distribution of the definitive host and concentrations of gymnospores in the water, but there are no data available for this.

The intensity of infection is generally considered to be a function of the age of the oyster, the older oysters generally having the larger number of cysts. However, some individuals of obvious old age were comparatively free of the parasite, although they were found in a community of high incidence of infestation. This fact, plus the seasonal fluctuation in infections, warrants our calling attention to the possibility that the oyster resists the infection or is able to eliminate the encysted spores, or both.

CONCLUSIONS

1. Based on representative samples over a period of two years (1947-1948), oysters from the major producing area of Louisiana were found to be 100% infected with the gregarine parasite *Nematopsis ostrearum*. Oysters from Pensacola Bay, Florida, were found to be 95.1% infected.

2. In Louisiana, the population of *N. ostrearum* was found to be higher in the area known as the "Louisiana Marsh," which is located east of the Mississippi River.

3. *N. ostrearum* infections in oysters increased significantly during the summer months in the lower mortality areas of Louisiana and at Pensacola, Florida.

4. *N. ostrearum* is not the controlling factor which is responsible for the Index of Condition of oysters or for the extensive mortalities of Louisiana oysters.

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REPORT ON COLLECTIONS

(Fiscal Year)

RECEIPTS

	1949-50	1950-51
Oyster Bedding Ground Rental	$ 34,845.50	$ 37,496.00
Privilege Tax	9,361.20	8,651.66
Tonnage Licenses	1,604.50	1,228.00
Dredging Licenses	10,000.00	7,050.00
Resale, Shop etc., Licenses	1,385.00	815.00
Transfer Fees	39.00	41.00
Sand	1,512.79	1,748.00
Shells (Act 227 of 1944)	114,427.31	81,981.53
(Act 533 of 1950)	....	52,472.70
Gravel	....	87.61
Total Receipts	$173,174.80	$191,571.50

REPORT ON PRODUCTION

(Calendar Year)

Total barrels of oysters taken from Louisiana waters:

	1950	1951
Terrebone	93,391.75	71,816.50
Lafourche	25,329.00	27,637.50
Plaquemines	140,582.50	115,922.00
Jefferson	13,515.00	14,384.00
St. Bernard	197,781.87	237,314.15
Total Barrels	470,600.12	467,074.15

Total cubic yards of sand, shells and gravel taken from Louisiana waters:

	1950	1951
Sand	107,117.62	108,715.54
Oyster Shells	1,351,409.72	1,816,512.50
Clam Shells	2,441,900.66	1,813,414.64
Gravel	1,906.00	953.00

DIVISION OF FISH AND GAME

MAJOR JAMES BROWN, *Director*

Major James Brown

IN accordance with the program initiated by Commissioner Clements in 1948, the activities of this Division have been greatly enlarged for a continued effort for the restoration of our fish and game resources. To accomplish this program, the Division is divided into the following sections:

Director's Office—New Orleans

Department Biologist—New Orleans

Federal Aid—Baton Rouge

Game Distribution and Plant Upkeep — Baton Rouge

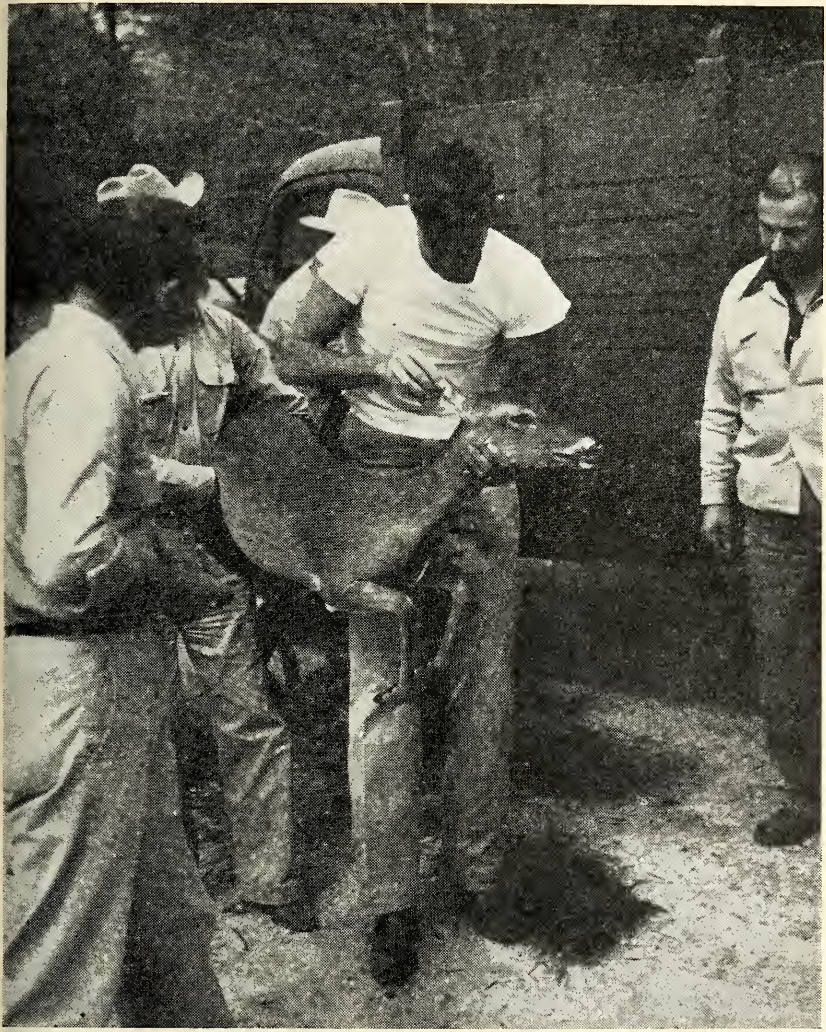
Predator Control—state wide

Water Hyacinth—state wide
Baton Rouge Quail Hatchery—Baton Rouge
Lacombe Quail Hatchery—Lacombe
Lacombe Fish Hatchery—Lacombe
Monroe Fish Hatchery—Monroe
Beechwood Fish Hatchery—Forest Hill
Fish Rescue Crew No. 1—Newellton
Fish Rescue Crew No. 2—Forest Hill
Lake Bruin Fish Preserve—St. Joseph
Northwest Louisiana Fish and Game Preserve—Natchitoches
Lake Bistineau Fish and Game Preserve—McDade
Catahoula Lake Sanctuary—Deville

The report of the Department biologist and the Federal-Aid Section will follow this report.

Game distribution and plant upkeep has been ably and efficiently handled by Mr. Fred Myers, Baton Rouge, with the aid of two assistants and local labor whenever needed. This section is equipped with a trailer truck and a half-ton pickup truck

Commissioner Ernest S. Clements, of the Louisiana Department of Wild Life and Fisheries, watching the liberation of full grown wild turkeys in the West Bay game preserve in Allen Parish.

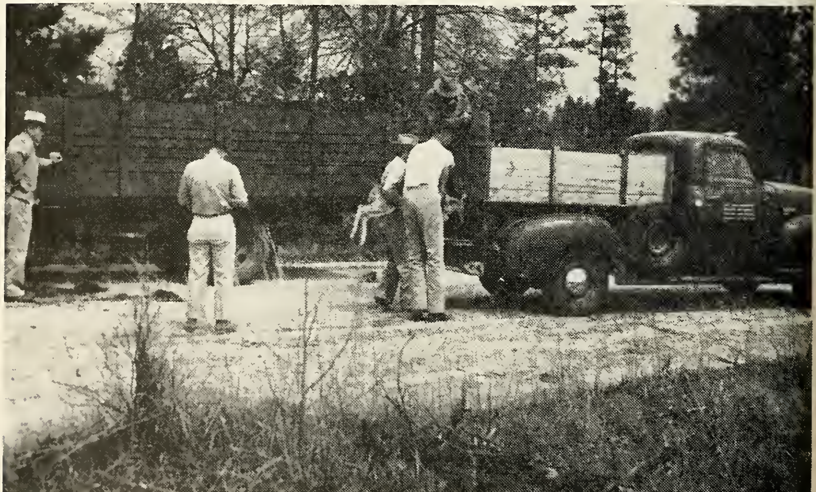


Tagging deer before their liberation on game preserve.

The trailer body has removable racks for the transportation of turkeys and three crates especially designed for the transportation of deer.

The operation of the two quail hatcheries is directly supervised by Mr. Myers. In 1950 the Lacombe Hatchery was operated as a complete unit and distributed 689 quail. In 1951 it was operated as a rearing station, receiving 2100 five-weeks-old quail

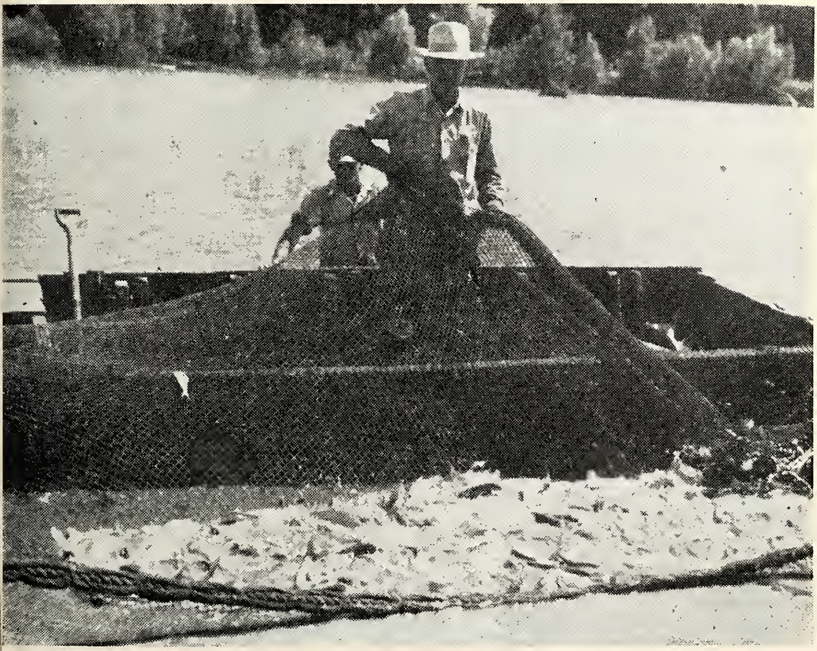
Deer coming out of truck for liberation on game preserve.



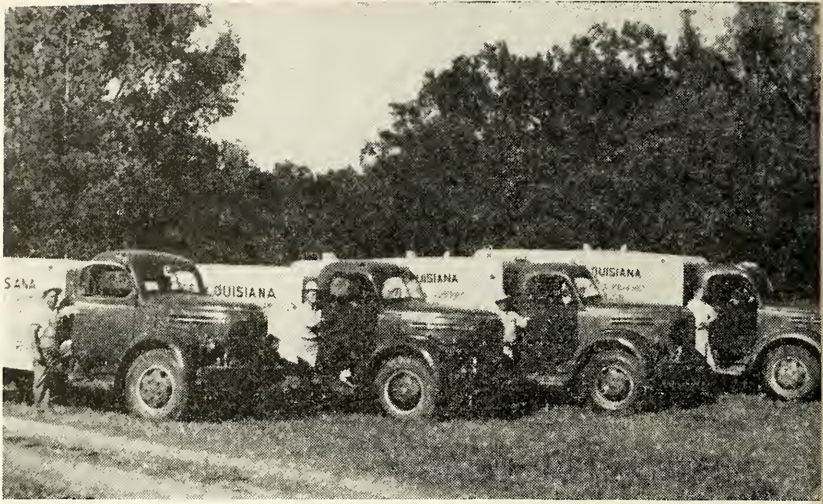
Loading trapped deer for transportation to another location for liberation in restocking program.

from the Baton Rouge Quail Hatchery and releasing 1506 quail at seventeen to twenty weeks old. The Baton Rouge Hatchery raised and distributed 1744 quail averaging sixteen weeks old in 1950 and in 1951 distributed 2832 sixteen- to twenty-weeks-old, in addition to the 2100 five-weeks-old quail delivered to the Lacombe Rearing Station.

1950	Quail purchased and distributed	33,597
1950	Quail raised and distributed from hatcheries	2,433
	Total 1950 Distribution	36,030
1951	Quail purchased and distributed	46,273
1951	Quail raised and distributed from hatcheries	4,338
	Total 1951 Distribution	50,611



Fish rescue work showing seine full of fish of all kinds.



Fleet of thermal trucks used by the Fish and Game Division of the Depart ment of Wild Life and Fisheries in the transportation of fish rescued fron borrow pits to the state's lakes and streams for restocking.

Men and boys pulling seine in fish rescue work.

The turkey program has continued; a major effort being made to restore the wild turkey in the Calcasieu River basin. In addition all of the game refuges, Beauregard, Vernon, Madison, Tensas and Morehouse Parishes have been restocked.

1950 Turkey restocked	1,754
1951 Turkey restocked	1,344

The deer program was enlarged in 1950 and orders were placed for a much larger distribution in 1951. However, a severe drought in Texas prevented them from exporting any deer and a bad trapping season in Wisconsin cut down their deliveries to 161 out of orders for 250.

1950 Deer distributed	373
1951 Deer distributed	201

The squirrels were available in 1950 but in 1951 the Sandhill Game Farm was able to trap and deliver only 192 of their large gray squirrels. The Federal-Aid Section have dyed their tails, tagged them and released them in the West Bay Refuge and the Sabine Refuge. The success of this project will be studied by one of the Federal-Aid biologists.

The fish rescue crews have continued their excellent work; 1950 was a record year that will be hard to ever reach again. Perfect water and weather conditions following the spring rise in the Ouachita River area made it possible for our seining crew to rescue almost three million fingerling bass, bream and crappie. Those conditions didn't occur in 1951 but the fish rescued and those produced in our three fish hatcheries were large and excellent fish. The complete record of all fish distribution for the years 1950 and 1951 follow:

FISH DISTRIBUTION—1950

Seining Crew No. 1—Jim C. Rhoads, Supervisor

BORROW PITS		WHITE PERCH		BASS		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
1/ 3/50	Tensas	200	175	18	30	400	125	618	330	Lake Providence Lake	East Carroll
1/ 4/50	Tensas	300	275			150	50	450	325	Lake Providence Lake	East Carroll
1/ 4/50	Tensas	300	200			400	150	700	350	Lake Bruin	Tensas
1/ 9/50	Tensas	300	175			400	100	700	275	Horseshoe Lake	Caldwell
1/10/50	Tensas	700	375					700	375	Davis' Lake	Caldwell
1/10/50	Tensas	400	225			500	200	900	425	Long Lake	Caldwell
4/19/50	Tensas	150	75	75	60	600	150	825	285	Hartford's Lake	Claiborne
4/20/50	Tensas	200	60	26	20	500	150	726	230	Lake Providence Lake	East Carroll
4/21/50	Tensas	100	40	32	25	900	200	1,032	265	Camps' Lake	Claiborne
4/26/50	Tensas	175	75	32	30	750	200	957	305	Chemin-a-Haut	Morehouse
4/28/50	Tensas			26	25	1,150	300	1,176	325	Lake Formosia	Lincoln
5/ 3/50	Tensas	400	200	28	32	300	100	728	332	Ark.-La. Lake	Caddo
5/ 3/50	Tensas	200	100	20	20	400	125	620	245	Bear Lake	Madison
5/ 4/50	Tensas	450	200	16	25	200	75	666	300	Dorcheat Bayou	Webster
5/ 5/50	Tensas	500	225	16	25	200	70	716	320	Lake Formosia	Lincoln
5/ 5/50	Tensas	600	250	20	40	150	50	770	340	Lake Formosia	Lincoln
5/ 8/50	Tensas	400	175	14	20	400	150	814	345	Reese Lake	Lincoln
5/ 9/50	Tensas	50	35			225	150	275	185	Lake Marydale	West Feliciana
5/ 9/50	Tensas	224	200	20	50			244	250	University Lake	East Baton Rouge
5/10/50	Tensas	500	250	14	20	300	75	814	345	Monk's Lake	Claiborne
5/10/50	Tensas	200	100	12	16	500	200	712	316	Lake Louie	Catahoula
5/11/50	Tensas	475	275	22	30	155	75	652	380	Ark.-La. Lake	Caddo
5/12/50	Tensas	150	100	10	12	350	125	510	237	Callahan Lake	Allen
5/12/50	Tensas	50	30			500	200	550	230	Saddle Tree Lake	Tensas
5/22/50	Ouachita	33,000	100	24	12	10,000	20	43,024	132	Clear Lake	Richland
5/22/50	Ouachita	24,000	84	11	6	10,000	20	34,011	110	Clear Lake	Richland
5/22/50	Ouachita	15,000	150	10		4,000	40	19,010	190	Clear Lake	Richland
5/22/50	Ouachita	18,000	180	14		6,000	60	24,014	240	Clear Lake	Richland

FISH DISTRIBUTION—1950 (Continued)

Seining Crew No. 1—Jim C. Rhoads, Supervisor

BORROW PITS		WHITE PERCH		BASS		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
5/22/50	Ouachita	12,000	120	11		4,000	40	16,011	160	Clear Lake	Richland
5/22/50	Ouachita	16,000	160			6,000	60	22,000	220	Clear Lake	Richland
5/22/50	Ouachita	16,000	160	12		3,000	30	19,012	190	Clear Lake	Richland
5/22/50	Ouachita	40,000	400	24		6,000	60	46,024	460	Clear Lake	Richland
5/23/50	Ouachita	22,000	220	20		80	8	22,100	228	Clear Lake	Richland
5/23/50	Ouachita	12,000	120	8		2,000	20	14,008	140	Bayou Bartholomew	Morehouse
5/23/50	Ouachita	18,000	180	16		3,000	30	21,016	210	Cheniere Lake	Ouachita
5/23/50	Ouachita	15,000	150	12		3,000	30	18,012	180	Clear Lake	Richland
5/23/50	Ouachita	22,000	66	20	10	8,000	16	30,020	92	Clear Lake	Richland
5/23/50	Ouachita	12,000	36	8	4	2,000	4	14,008	44	Bayou Bartholomew	Morehouse
5/23/50	Ouachita	33,000	99	28	14	6,000	12	39,028	125	Cheniere Lake	Ouachita
5/24/50	Ouachita	41,000	123	50	25	9,000	18	50,050	166	Bayou Bartholomew	Morehouse
5/24/50	Ouachita	9,000	27	8	4	2,000	4	11,008	35	Bayou DeSiard	Ouachita
5/24/50	Ouachita	12,000	36	14	7	3,000	6	15,014	49	Saddle Tree Lake	Tensas
5/24/50	Ouachita	11,000	110	10		2,000	20	13,010	130	Bayou Bartholomew	Morehouse
5/24/50	Ouachita	9,000	90	8		2,000	20	11,008	110	Bayou DeSiard	Ouachita
5/24/50	Ouachita	12,000	120	14		3,000	30	15,014	150	Saddle Tree Lake	Tensas
5/24/50	Ouachita	12,000	120	12		3,000	30	15,012	150	Clear Lake	Richland
5/24/50	Ouachita	18,000	180	28		4,000	40	22,028	220	Bayou Bartholomew	Morehouse
5/25/50	Ouachita	16,000	160	16		4,000	40	20,016	200	Lake Providence Lake	East Carroll
5/25/50	Ouachita	11,000	110	12		3,000	30	14,012	140	Cheniere Lake	Ouachita
5/25/50	Ouachita	16,000	160	14		2,000	20	18,014	180	Clear Lake	Richland
5/25/50	Ouachita	18,000	180			4,000	40	22,000	220	Bayou Bartholomew	Ouachita
5/25/50	Ouachita	16,000	160	12		2,000	20	18,012	180	Bayou Bartholomew	Ouachita
5/25/50	Ouachita	16,000	48	16	8	4,000	8	20,016	64	Lake Providence	East Carroll
5/25/50	Ouachita	11,000	33	12	6	3,000	6	14,012	45	Cheniere Lake	Ouachita
5/25/50	Ouachita	16,000	48	14	7	2,000	4	18,014	59	Crannie Lake	Richland
5/25/50	Ouachita	34,000	102	12	6	6,000	12	40,012	120	Bayou Bartholomew	Ouachita

FISH DISTRIBUTION—1950 (Continued)

Seining Crew No. 1—Jim C. Rhoads, Supervisor

BORROW PITS		WHITE PERCH		BASS		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
5/26/50	Ouachita	17,000	49	12	6	4,000	7	21,012	62	Phillips Bayou	Ouachita
5/26/50	Ouachita	40,000	120	24	12	6,000	12	46,024	144	Bayou Bartholomew	Ouachita
5/26/50	Ouachita	12,000	37	10	5	3,000	5	15,010	47	Bayou Bartholomew	Ouachita
5/26/50	Ouachita	12,000	120	10		2,000	20	14,010	140	Bayou DeSiard	Ouachita
5/29/50	Ouachita	900	56	28	14	500	40	1,428	110	Lake Providence Lake	East Carroll
5/29/50	Ouachita	600	48	14	7	700	45	1,314	100	Cheniere Lake	Ouachita
5/29/50	Ouachita	500	40	27	14	600	50	1,127	104	Lake Providence Lake	East Carroll
5/29/50	Ouachita	800	64	10	5	400	25	1,210	94	Bayou Bartholomew	Morehouse
5/29/50	Ouachita	750	50	14	7	600	40	1,364	97	Black Bayou.	Ouachita
5/29/50	Ouachita	500	40	21	10	300	20	821	70	Clear Lake	Richland
5/30/50	Ouachita	15,000	45	7	3	4,000	8	19,007	56	Bayou DeSiard	Ouachita
5/30/50	Ouachita	16,000	48	14	7	5,000	10	21,014	65	Bayou DeSiard	Ouachita
5/30/50	Ouachita	600	48	19	10	400	40	1,019	98	Horseshoe Lake	Morehouse
5/30/50	Ouachita	800	64	22	11	500	50	1,322	125	Crew Lake	Richland
5/30/50	Ouachita	500	70	47	23	600	60	1,147	153	Bayou Bartholomew	Ouachita
5/31/50	Ouachita	600	50	64	32	400	35	1,064	117	Johnson Lake	Claiborne
5/31/50	Ouachita	12,000	36	12	6	4,000	10	16,012	52	Crew Lake	Richland
5/31/50	Ouachita	9,000	27			3,000	10	12,000	37	Bayou DeSiard	Ouachita
5/31/50	Ouachita	7,000	21			3,000	10	10,000	31	Cheniere Lake	Ouachita
6/ 1/50	Ouachita	12,000	36			4,000	10	16,000	46	Bayou DeSiard	Ouachita
6/ 1/50	Ouachita	500	50			300	30	800	80	Bayou Bartholomew	Morehouse
6/ 5/50	Tensas	450	250	17	20	300	100	767	370	Lake Providence Lake	East Carroll
6/ 5/50	Tensas	400	175	23	20	300	75	273	270	Lake Providence Lake	East Carroll
6/ 6/50	Tensas	500	250	15	15	200	70	715	335	Tangipahoa Lake	Tangipahoa
6/ 6/50	Tensas	550	225	23	30	300	75	873	330	Tangipahoa Lake	Tangipahoa
6/ 7/50	Tensas	400	150	25	20	300	100	725	270	Chemin-a-Haut	Morehouse
6/ 8/50	Tensas	600	250	23	15	150	50	773	315	Lake Bistineau	Bossier
6/ 8/50	Tensas	450	200	37	30	400	100	887	330	Lake Bistineau	Bossier

FISH DISTRIBUTION—1950 (Continued)

Seining Crew No. 1—Jim C. Rhoads, Supervisor

BORROW PITS		WHITE PERCH		BASS		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
6/ 9/50	Tensas	450	200	83	50			533	250	Bear Lake	Madison
6/ 9/50	Tensas	600	300					600	300	Girl Scout Camp	Lincoln
6/12/50	Tensas	500	200	48	50			548	250	Lake Despair	Madison
6/12/50	Tensas	400	175	66	50			466	225	Lake Despair	Madison
6/13/50	Tensas	600	300	26	60			626	360	Ark.-La. Lake	Caddo
6/14/50	Tensas	200	100	3	9			203	109	Lake Bruin	Tensas
6/19/50	Madison	550	300					550	300	Bear Lake	Madison
6/20/50	Tensas	600	325					600	325	Lake Bistineau	Webster
6/21/50	Tensas	600	350					600	350	L. S. U. Lake	East Baton Rouge
6/22/50	Tensas	450	250					450	250	Bear Lake	Madison
6/26/50	Tensas	700	400	32	40			732	440	Saline Lake	Winn
6/27/50	Tensas	500	250	17	30			517	280	Lake Despair	Madison
6/28/50	Ouachita	15,000	105	2,000	14	3,000	21	20,000	140	Chemin-a-Haut	Morehouse
6/28/50	Ouachita	23,000	160	2,000	14	5,000	35	30,000	209	Bayou DeSiard	Ouachita
6/28/50	Ouachita	15,000	105	2,000	14	3,000	21	20,000	140	Horseshoe Lake	Morehouse
6/28/50	Ouachita	20,000	200	2,000	20	3,000	30	25,000	250	Bayou DeSiard	Ouachita
6/28/50	Ouachita	20,000	140	2,000	14	3,000	21	25,000	175	Foursome Lake	Lincoln
6/28/50	Ouachita	15,000	150	2,000	20	3,000	30	20,000	200	Horseshoe Lake	Morehouse
6/28/50	Ouachita	15,000	150	1,000	10	4,000	40	20,000	200	Chemin-a-Haut	Morehouse
6/28/50	Ouachita	23,000	230	2,000	20	5,000	50	20,000	300	Bayou DeSiard	Ouachita
6/28/50	Ouachita	20,000	200	2,000	20	3,000	30	25,000	250	Foursome Lake	Lincoln
6/28/50	Ouachita	20,000	200	2,000	20	3,000	30	25,000	250	Bayou DeSiard	Ouachita
6/28/50	Ouachita	25,000	250	2,000	20	3,000	30	30,000	300	Country Club (Bayou DeSiard)	Ouachita
6/28/50	Ouachita	20,000	200	1,000	10	4,000	40	25,000	250	Bayou Bartholomew	Morehouse
6/28/50	Ouachita	24,000	175			5,000	35	29,000	210	Bayou Bartholomew	Morehouse
6/28/50	Ouachita	20,000	140			5,000	35	25,000	175	Bayou Bartholomew	Morehouse
6/29/50	Ouachita	25,000	175	2,000	14	3,000	21	30,000	210	Bayou Bartholomew	Morehouse

FISH DISTRIBUTION—1950 (Continued)

Seining Crew No. 1—Jim C. Rhoads, Supervisor

BORROW PITS		WHITE PERCH		BASS		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
6/29/50	Ouachita	25,000	175	2,000	14	3,000	21	30,000	210	Bayou DeSiard	Ouachita
6/29/50	Ouachita	20,000	140	2,000	14	3,000	21	25,000	175	Bayou DeSiard	Ouachita
6/29/50	Ouachita	17,000	120	1,000	7	2,000	14	20,000	141	Crew Lake	Richland
6/29/50	Ouachita	20,000	140	2,000	14	3,000	21	25,000	175	Lake Providence Lake	East Carroll
6/29/50	Ouachita	15,000	150	2,000	20	3,000	30	20,000	200	Lake Providence Lake	East Carroll
6/29/50	Ouachita	15,000	150	3,000	30	2,000	20	20,000	200	Lake Bruin	Tensas
6/29/50	Ouachita	17,000	170	1,000	10	2,000	20	20,000	200	Crew Lake	Richland
6/29/50	Ouachita	25,000	250	2,000	20	3,000	30	30,000	300	Bayou Bartholomew	Ouachita
6/29/50	Ouachita	25,000	250	2,000	20	3,000	30	30,000	300	Bayou DeSiard	Ouachita
6/29/50	Ouachita	20,000	200	2,000	20	3,000	30	25,000	250	Bayou DeSiard	Ouachita
6/29/50	Ouachita	20,000	140	1,000	7	4,000	28	25,000	175	Saddle Tree Lake	Tensas
6/30/50	Ouachita	50,000	350	4,000	28	6,000	42	60,000	420	Bayou DeSiard	Ouachita
6/30/50	Ouachita	20,000	140	2,000	14	4,000	28	26,000	182	Black Bayou	Ouachita
6/30/50	Ouachita	7,000	50	....	....	7,000	50	14,000	100	Bayou Bartholomew	Ouachita
6/30/50	Ouachita	25,000	175	1,000	7	4,000	28	30,000	210	Little Lake	Lafourche and Morehouse
6/30/50	Ouachita	10,000	70	1,000	7	2,000	14	13,000	91	Crew Lake	Richland
6/30/50	Ouachita	25,000	250	1,000	10	4,000	40	30,000	300	Little Lake	Lafourche and Morehouse
6/30/50	Ouachita	20,000	200	2,000	20	4,000	40	26,000	260	Black Bayou	Ouachita
6/30/50	Ouachita	5,000	50	4,000	40	6,000	60	15,000	150	Bayou DeSiard	Ouachita
6/30/50	Ouachita	2,000	20	2,000	20	4,000	40	8,000	80	Black Bayou	Ouachita
6/30/50	Ouachita	7,000	70	....	....	7,000	70	14,000	140	Bayou Bartholomew	Morehouse
7/ 1/50	Ouachita	20,000	200	2,000	20	3,000	30	25,000	250	Saline Lake	Winn
7/ 1/50	Ouachita	20,000	200	2,000	20	3,000	30	25,000	250	Lake Bistineau	Webster
7/ 1/50	Ouachita	20,000	140	1,000	7	4,000	28	25,000	175	Saline Lake	Winn
7/ 1/50	Ouachita	20,000	140	2,000	14	3,000	21	25,000	175	Lake Bistineau	Webster
7/ 1/50	Ouachita	10,000	100	5,000	50	1,000	100	16,000	250	Bear Lake	Madison

FISH DISTRIBUTION—1950 (Continued)
Seining Crew No. 1—Jim C. Rhoads, Supervisor

BORROW PITS		WHITE PERCH		BASS		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
7/ 1/50	Ouachita	15,000	150	5,000	50	5,000	50	25,000	250	Lake Bruin	Tensas
7/ 3/50	Ouachita	10,000	100	5,000	50	10,000	100	25,000	250	Black Bayou	Ouachita
7/ 3/50	Ouachita	35,000	350					35,000	350	Bayou DeSiard	Ouachita
7/ 3/50	Ouachita	4,000	40	5,000	50	4,000	40	13,000	130	Phillips Bayou	Ouachita
7/ 3/50	Ouachita	5,000	50	5,000	50	5,000	50	15,000	150	Bayou DeSiard	Ouachita
7/ 3/50	Ouachita	5,000	50	5,000	50	5,000	50	15,000	150	Phillips Bayou	Ouachita
7/ 3/50	Ouachita	4,000	40	4,000	40	4,000	40	12,000	120	Phillips Bayou	Ouachita
7/ 3/50	Ouachita	25,000	250	3,000	50	5,000	50	33,000	350	Bayou DeSiard	Ouachita
7/ 3/50	Ouachita	5,000	50	5,000	50	5,000	50	15,000	150	Phillips Bayou	Ouachita
7/ 3/50	Ouachita	5,000	50	5,000	50	5,000	50	15,000	150	Bayou DeSiard	Ouachita
7/ 3/50	Ouachita	10,000	100	5,000	50	10,000	100	25,000	250	Bear Lake	Madison
7/ 3/50	Ouachita	10,000	100	5,000	50	10,000	100	25,000	250	Lake Bruin	Tensas
7/ 3/50	Ouachita	10,000	100	5,000	50	10,000	100	25,000	250	Black Bayou	Ouachita
7/ 5/50	Ouachita	3,000	50	1,000	10	4,000	40	8,000	100	Bayou DeSiard	Ouachita
7/ 5/50	Ouachita	5,000	50	1,000	10	4,000	40	10,000	100	Bayou DiSaird	Ouachita
7/ 5/50	Ouachita	3,000	30	5,000	50			8,000	80	Bayou Bartholomew	Morehouse
7/ 5/50	Ouachita	15,000	150	5,000	50	5,000	50	25,000	250	Baker's Lake	Lincoln
7/ 5/50	Ouachita	3,000	30	1,000	10	4,000	40	8,000	80	Bayou DeSiard	Ouachita
7/ 5/50	Ouachita	4,000	40	1,000	10	5,000	50	10,000	100	Bayou DeSiard	Ouachita
7/ 5/50	Ouachita	2,000	20	1,000	10	5,000	50	8,000	80	Bayou Bartholomew	Morehouse
7/ 5/50	Ouachita	15,000	150	1,500	50	5,000	50	25,000	250	Chemin-a-Haut	Morehouse
7/ 5/50	Ouachita	15,000	150	5,000	5	5,000	5	25,000	160	Horseshoe Lake	Morehouse
7/ 7/50	Ouachita			4,000	40	4,000	40	8,000	80	Lake Louie	Catahoula
7, 7/50	Ouachita			4,000	40	4,000	40	8,000	80	Lake Louie	Catahoula
7/ 7/50	Ouachita	5,000	50			5,000	50	10,000	100	Chattam Lake	Jackson
7/ 7/50	Ouachita	15,000	150	5,000	50	10,000	100	30,000	300	Lewis & Kilpatrick	Claiborne
7/ 7/50	Ouachita	15,000	150	5,000	50	10,000	100	30,000	300	Indian Lake	Madison
7/ 7/50	Ouachita	15,000	150	5,000	5	10,000	10	30,000	165	Clear Lake	Richland

FISH DISTRIBUTION—1950 (Continued)
Seining Crew No. 1—Jim C. Rhoads, Supervisor

BORROW PITS		WHITE PERCH		BASS		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
7/ 8/50	Ouachita	1,000	10	1,000	10			2,000	20	Lake Bruin	Tensas
7/10/50	Tensas	200	270	33	40			533	310	Horseshoe Lake	Caldwell
7/10/50	Tensas	600	320	30	40			630	360	Amite Lake	Tangipahoa
7/12/50	Tensas	400	300	33	45			433	345	Boeuf River	West Carroll
7/12/50	Tensas	150	75	10	10			160	93	Lake Bruin	Tensas
7/12/50	Ouachita	15,000	150	1,000	10	7,000	70	23,000	230	Bayou DeSiard	Ouachita
7/12/50	Ouachita	12,000	120	2,000	20	8,000	80	22,000	220	Phillips Bayou	Ouachita
7/12/50	Ouachita	8,000	80	5,000	50	6,000	60	19,000	190	Bayou Bartholomew	Morehouse
7/12/50	Ouachita	12,000	120	2,000	20	8,000	80	22,000	220	Phillips Bayou	Ouachita
7/12/50	Ouachita	8,000	80	6,000	60	8,000	80	22,000	220	Bayou Bartholomew	Morehouse
7/12/50	Ouachita	15,000	150	1,000	10	7,000	70	23,000	230	Bayou DeSiard	Ouachita
7/13/50	Ouachita	15,000	150	4,000	40	3,000	30	22,000	220	Phillips Bayou	Ouachita
7/13/50	Ouachita	10,000	100	5,000	50	5,000	50	20,000	200	Bayou Bartholomew	Morehouse
7/13/50	Ouachita	800	500	40	60			840	560	Will's Lake	Catahoula
7/14/50	Ouachita	400	150	35	40			435	190	Bear Lake	Madison
7/14/50	Ouachita	15,000	150	4,000	40	6,000	60	25,000	250	Phillips Bayou	Ouachita
7/14/50	Ouachita	14,000	140	6,000	60	6,000	60	26,000	260	Black Bayou	Ouachita
7/14/50	Ouachita	15,000	150	5,000	50	5,000	50	25,000	250	Bayou DeSiard	Ouachita
7/15/50	Ouachita	15,000	150	5,000	50	4,000	40	24,000	240		Lincoln
7/15/50	Ouachita	15,000	150	5,000	50	6,000	60	26,000	260	Bayou Bartholomew	Morehouse
7/17/50	Ouachita	14,000	140	6,000	60	5,000	50	25,000	250	Chennie Lake	Ouachita
7/17/50	Madison	750	300					750	300	Tickfaw River	Livingston
7/18/50	Madison	800	400					800	400	Riders Lake	Allen
7/19/50	Madison	820	420					820	420	Boeuf River	West Carroll
7/19/50	Madison	170	340					710	340	Tickfaw River	Livingston
7/19/50	Ouachita	15,000	150	6,000	60	6,000	60	27,000	270		Livingston
7/19/50	Ouachita	16,000	160	4,000	40	6,000	60	26,000	260	Chennie Lake	Ouachita
7/20/50	Madison	800	250					800	250	Bear Lake	Madison

FISH DISTRIBUTION—1950 (Continued)

Seining Crew No. 1—Jim C. Rhoads, Supervisor

BORROW PITS		WHITE PERCH		BASS		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
7/24/50	Ouachita	25,000	250					25,000	250	Bayou DeSiard	Ouachita
7/24/50	Ouachita	9,000	90	6,000	60	5,000	50	20,000	200	Black Bayou	Ouachita
7/26/50	Ouachita	8,000	20	7,000	70	7,000	70	22,000	220	Bayou Bartholomew	Ouachita
7/26/50	Ouachita	12,000	120	6,000	60	6,000	60	24,000	240	Chennie Lake	Ouachita
7/26/50	Concordia	1,400	500					1,400	500	Lake St. John	Concordia
7/27/50	Concordia	400	200					400	200	Lake St. John	Concordia
7/27/50	Ouachita	12,000	120	6,000	60	8,000	80	26,000	260	Black Bayou	Ouachita
7/27/50	Ouachita	8,000	80	8,000	80	8,000	80	24,000	240	Bayou DeSiard	Ouachita
7/28/50	Concordia	500	200					500	200	Lake St. John	Concordia
7/29/50	Ouachita	8,000	80	6,000	60	2,000	20	16,000	160	Crew Lake	Richland
7/29/50	Ouachita	8,000	80	6,000	60	6,000	60	20,000	200	Bayou DeSiard	Ouachita
7/29/50	Ouachita	8,000	80	6,000	60	2,000	20	16,000	160	Crew Lake	Richland
7/31/50	Ouachita	8,000	80	6,000	60	8,000	80	22,000	220		Lincoln
7/31/50	Ouachita	10,000	100	260	40	5,000	50	15,000	190	Dorchent Creek	Webster
7/31/50	Ouachita	8,000	80	60	30	4,000	30	12,060	140	Lake Ervin	Richland
7/31/50	Ouachita	800	100	90	30	800	100	1,690	230	Girl Scout Camp	Lincoln
8/ 1/50	Ouachita	200	50	750	100	600	40	1,550	190	Tickfaw River	Livingston
8/ 1/50	Ouachita	200	20	750	10	14,000	140	14,950	170	Chennie Bayou	Ouachita
8/ 2/50	Concordia	300	100	105	50			405	150	Lake Concordia	Concordia
8/ 3/50	Concordia	740	200	12	10	110	75	862	285	Lake Concordia	Concordia
8/ 4/50	Concordia	810	240	8	10	35	30	853	280	Lake Concordia	Concordia
8/ 7/50	Concordia	800	200	16	20			816	220	Lake Concordia	Concordia
8/ 8/50	Concordia	350	300					350	300	Saline Lake	Winn
8/ 8/50	Concordia	450	350					450	350	Tickfaw River	Livingston
8/ 8/50	Ouachita	6,000	60	6,000	60	2,000	20	14,000	140	Chennie Bayou	Ouachita
8/ 8/50	Concordia	350	300					350	300	Saline Lake	Winn
8/ 8/50	Concordia	450	350					450	350	Tickfaw River	Livingston
8/10/50	Concordia	950	600					950	600	Will's Lake	Catahoula

FISH DISTRIBUTION—1950 (Continued)
Seining Crew No. 1—Jim C. Rhoads, Supervisor

BORROW PITS		WHITE PERCH		BASS		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
8/15/50	Concordia	1,500	525	47	60			1,547	585	Noover Lake	Catahoula
8/16/50	Concordia	400	125					400	125	Cut Off Bayou	Concordia
8/17/50	Concordia	600	175	28	35			628	210	Cut Off Bayou	Concordia
8/18/50	Concordia	900	450					900	450	City Park	East Baton Rouge
8/18/50	Concordia	250	125					250	125	Concordia Lake	Concordia
8/21/50	Concordia	700	300					700	300	Cut Off Bayou	Concordia
8/22/50	Concordia	900	275					900	275	Concordia Lake	Concordia
8/24/50	Tensas	100	40	12	30	1,000	200	1,112	270	Tickfaw River	Livingston
8/24/50	Tensas	200	75	10	20	1,100	225	1,310	320	Colyell Bay	Livingston
8/25/50	Tensas	925	400			1,100	280	2,025	680	State Park Lake	East Baton Rouge
8/28/50	Tensas	700	300	20	30			720	330	Lake Dean	Franklin
8/29/50	Tensas	650	275	18	25			668	300	Bear Lake	Madison
8/30/50	Tensas	450	175			500	150	950	325	Saddle Tree Lake	Tensas
8/31/50	Tensas	700	350	23	30	125	40	848	420	Colyell Bay	Livingston
8/31/50	Tensas	600	300	22	35	200	50	822	385	Lake Providence Lake	East Carroll
9/ 1/50	Tensas	600	250	16	25	300	75	916	350	Saline Lake	Winn
9/ 4/50	Tensas	600	300	50	75	400	100	1,050	475	Long Lake	Caldwell
9/ 5/50	Tensas	800	400	21	40	200	50	1,021	490	Bayou Mason	West Carroll
9/ 5/50	Tensas	105	50			75	15	180	65	Lake Bruin	Tensas
9/ 6/50	Tensas	700	350			31	60	731	410	Prestige Lake	Claiborne
9/11/50	Madison	800	400					800	400	Prestige Lake	Claiborne
9/12/50	Madison	900	375					900	375	Amite River	Livingston
9/14/50	Madison	1,200	400	20	30			1,220	430	Long Lake	Caldwell
9/15/50	Madison	700	300	16	40			176	340	Bear Lake	Madison
9/15/50	Madison	300	150	10	20			310	170	Lake Bruin	Tensas
9/18/50	Madison	850	400	22	45			872	445	Saline Lake	Winn
9/18/50	Madison	900	400	20	40			920	440	Bear Lake	Madison
9/19/50	Madison	750	300	30	45			780	345	Lake Providence Lake	East Carroll

FISH DISTRIBUTION—1950 (Continued)
Seining Crew No. 1—Jim C. Rhoads, Supervisor

BORROW PITS		WHITE PERCH		BASS		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
9/20/50	Madison	900	400					900	400	Lake Bruin	Tensas
9/21/50	Madison	850	375					850	375	Lake Bruin	Tensas
9/21/50	Madison	800	300					800	300	Lake St. John	Concordia
9/22/50	Concordia	1,800	800					1,800	800	Lake Concordia	Concordia
9/25/50	Concordia	700	350					700	350	Lake St. John	Concordia
9/26/50	Concordia	600	300	8	12			608	312	Bodcau Bayou	Webster
9/27/50	Concordia	50	25	20	30	1,250	300	1,320	355	City Park	East Baton Rouge
9/27/50	Tensas	800	200					800	200	Bear Lake	Madison
9/28/50	Tensas	300	100	10	20	1,100	300	1,410	420	Saline Lake	Winn
9/20/50	Tensas	400	175	12	18	900	275	1,312	468	Foursome Lake	Lincoln
9/28/50	Tensas	200	75	19	35	1,200	300	1,419	410	Saddle Tree Lake	Tensas
9/29/50	Tensas	700	350					700	350	Lake Louie	Catahoula
10/ 2/50	Tensas	600	300			200	65	800	365	Chemin-a Haut	Morehouse
10/ 3/50	Concordia	700	275	16	20			716	295	Lake St. John	Concordia
10/ 4/50	Concordia	900	300					900	300	Long Lake	Caldwell
10/ 5/50	Concordia	750	300					750	300	Colyell Bay	Livingston
10/ 6/50	Concordia	600	300	16	20	200	65	600	300	Lake St. John	Concordia
10/ 9/50	Concordia	275	100					275	100	Bear Lake	Madison
10/10/50	Concordia	150	75			250	100	400	175	Lake Bruin	Tensas
10/11/50	Concordia	400	200	43	60	500	150	943	410	Whiskey Chitto River	Allen
10/16/50	Concordia	290	100					290	100	Lake Bruin	Tensas
10/17/50	Concordia	275	90			400	125	675	215	Bear Lake	Madison
10/18/50	Concordia	400	200	68	80			468	280	Whiskey Chitto River	Allen
10/23/50	Concordia	250	100	12	14	65	20	327	134	Cross Lake	Concordia
10/24/50	East Carroll	302	302	12	18			314	320	Lake Providence Lake	East Carroll
10/25/50	East Carroll	275	275					275	275	Lake Providence Lake	East Carroll
10/26/50	East Carroll	320	300					320	300	Bayou Macon	West Carroll
10/27/50	East Carroll	220	220					220	220	Lake Providence Lake	East Carroll

FISH DISTRIBUTION—1950 (Continued)
Seining Crew No. 1—Jim C. Rhoads, Supervisor

BORROW PITS		WHITE PERCH		BASS		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
10/30/50	East Carroll	250	250	21	21			271	271	Lake Providence Lake	East Carroll
10/31/50	East Carroll	275	250					275	250	Bear Lake	Madison
11/ 1/50	East Carroll	320	320	15	16			335	336	Horseshoe Lake	Caldwell
11/ 1/50	East Carroll	375	375	14	12			389	387	Greer Lake	Claiborne
11/ 2/50	East Carroll	314	314	12	10			326	324	Lake Providence Lake	East Carroll
11/ 2/50	East Carroll	400	350	18	20			418	370	Lake Louie	Catahoula
11/ 6/50	East Carroll	880	645	12	12			892	657	Foursome Lake	Lincoln
11/ 8/50	East Carroll	375	300	14	15			389	315	Bayou Macon	West Carroll
11/14/50	East Carroll	600	300	11	12			611	312	Lake Beard	Claiborne
11/15/50	East Carroll	350	300			12	24	361	324	Lake Providence	East Carroll
11/16/50	East Carroll	400	320	6	6	8	12	414	338	Tangipahoa River	Tangipahoa
11/17/50	East Carroll	375	300	6	7	40	40	421	347	Caney Lake	Webster
11/17/50	East Carroll	150	100	8	7	31	30	189	137	Lake Providence	East Carroll
11/22/50	Monroe Fish Hatchery			2,160	60			2,160	60	Ten Mile Creek	Allen
11/22/50	Monroe Fish Hatchery			2,160	60			2,160	60	Six Mile Creek	Allen
11/22/50	Monroe Fish Hatchery			1,890	53			1,890	53	Whiskey Chitto River	Allen
11/22/50	Monroe Fish Hatchery			2,152	59			2,152	59	Lake Bistineau	Webster
11/22/50	Monroe Fish Hatchery	162	41	121	61	220	32	503	134	Lake Bistineau	Webster
11/27/50	Monroe Fish Hatchery			860	24	5,000	100	5,860	124	Harris Lake	Ouachita
11/27/50	Monroe Fish Hatchery			1,160	32	3,000	60	4,160	92	Wayne's Lake	Ouachita
11/27/50	Monroe Fish Hatchery			600	17	1,100	20	1,700	37	Bayou DeSiard	Ouachita
11/28/50	Monroe Fish Hatchery			4,000	111	1,000	20	5,000	131	Chemin-a-Haut	Morehouse
11/28/50	Monroe Fish Hatchery			4,500	125	9,000	180	13,500	305	Bayou DeSiard	Ouachita
11/29/50	Monroe Fish Hatchery					1,200	120	1,200	120	Bayou DeSiard	Ouachita
11/29/50	Monroe Fish Hatchery					9,000	90	9,000	90	Black Bayou	Ouachita
11/30/50	Monroe Fish Hatchery			2,341	105	7,000	140	9,341	245	Sand Lake	Beauregard
12/ 1/50	Monroe Fish Hatchery			500	11	2,000	40	2,500	51	Phillips Bayou	Ouachita
12/ 2/50	Monroe Fish Hatchery			375	11	2,000	40	2,375	51	Bayou DeSiard	Ouachita

FISH DISTRIBUTION—1950 (Continued)
Seining Crew No. 1—Jim C. Rhoads, Supervisor

BORROW PITS		WHITE PERCH		BASS		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
12/12/50	Lacombe Fish Hatchery			810	162			810	162	Abita River	St. Tammany
12/12/50	Lacombe Fish Hatchery			810	162			810	162	Tangipahoa River	Tangipahoa
12/13/50	Lacombe Fish Hatchery			905	181	800	27	1,705	208	Bogalusa River	Washington
12/13/50	Lacombe Fish Hatchery			810	162	900	30	1,710	192	Mile Creek.	St. Helena
12/13/50	Lacombe Fish Hatchery			912	181			912	181	Pushapatata Creek	Washington
12/14/50	Lacombe Fish Hatchery			980	196	520	26	1,500	222	Bogue Chitto River	Washington
12/14/50	Lacombe Fish Hatchery			742	148	400	20	1,142	168	Crittington Creek	St. Helena
12/14/50	Lacombe Fish Hatchery			675	135	600	30	1,275	165	Darden Creek	St. Helena
12/14/50	Lacombe Fish Hatchery			1,100	220			1,100	220	Tickfaw River	Livingston
12/14/50	Lacombe Fish Hatchery			820	164	700	35	1,520	199	Natalbany River	Livingston
12/15/50	Lacombe Fish Hatchery			900	225	400	40	1,300	265	Bogue Chitto River	St. Tammany
12/15/50	Lacombe Fish Hatchery			950	327	600	60	1,550	297	Tangipahoa River	Tangipahoa
12/15/50	Lacombe Fish Hatchery			400	100	1,200	120	1,600	220	Amite River	Livingston
12/15/50	Lacombe Fish Hatchery			300	75	1,500	150	1,800	225	Amite River	Livingston
	TOTAL	1,198,827	52,338	348,521	9,015	726,032	14,076	3,273,380	75,429		

FISH DISTRIBUTION—1950

Seining Crew No. 2—Ralph Briggs, Supervisor

BORROW PITS		WHITE PERCH		BASS		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
1/ 4/50	Beechwood Fish Hatchery			1,078	25	2,750	50	3,828	75	Calcasieu River	Rapides
1/ 4/50	Beechwood Fish Hatchery			117	55			117	55	Sandy Lake	Catahoula
1/ 6/50	Beechwood Fish Hatchery			909	65	2,250	22	3,159	87	Cocodria's Bayou	Rapides
1/ 7/50	Beechwood Fish Hatchery			1,132	55	2,150	20	3,282	75	Calcasieu River	Allen
1/ 7/50	Beechwood Fish Hatchery			900	65	3,600	25	4,500	90	Calcasieu River	Calcasieu
1/ 9/50	Catahoula	200	190					200	190	Lake Success	Rapides
1/10/50	Catahoula	100	100			100	100	200	200	Cocodria's Bayou	Rapides
1/11/50	Catahoula	200	190					200	190	Clear Lake	Winn
1/13/50	Catahoula	150	140					150	140	Cocodria's Bayou	Rapides
1/16/50	Catahoula	50	50			150	175	200	225	Saline Lake	Winn
1/16/50	Catahoula	200	200					200	200	Saline Lake	Winn
1/18/50	Catahoula	200	125			50	75	250	200	Sheriff	Caldwell
1/20/50	Catahoula	150	125			50	75	200	200	Baker's Pond	Vernon
1/23/50	Catahoula	150	150			50	75	200	225	Poco Lake	Concordia
1/24/50	Catahoula	150	150			75	100	225	250	Indian Creek	Rapides
1/26/50	Catahoula	100	100			50	75	150	175	Poco Lake	Concordia
1/27/50	Catahoula	200	200					200	200	Leonard Lake	Rapides
1/27/50	Federal Hatchery, Natchitoches					2,000	100	2,000	100		East Baton Rouge
1/30/50	Catahoula	200	200					200	200	Sheriff	Caldwell
2/ 1/50	Catahoula	100	100			50	50	150	150	Poco Lake	Concordia
2/ 4/50	Catahoula	75	75			75	75	150	150	Foursome Lake	Lincoln
2/ 7/50	Catahoula	150	150					150	150	Foursome Lake	Lincoln
2/10/50	Catahoula	50	50					50	50	Fish Creek	Grant
4/20/50	DeSoto					4,000	50	4,000	50	Smithport Lake	DeSoto
4/21/50	DeSoto					16,000	200	16,000	200	Clear Lake	DeSoto
4/22/50	DeSoto					16,000	200	16,000	200	Smithport Lake	DeSoto
4/24/50	DeSoto					16,000	200	16,000	200	Clear Lake	DeSoto

FISH DISTRIBUTION—1950 (Continued)
Seining Crew No. 2—Ralph Briggs, Supervisor

BORROW PITS		WHITE PERCH		BASS		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
4/25/50..	DeSoto					16,000	220	16,000	200	Smithport Lake	DeSoto
4/26/50..	DeSoto					16,000	200	16,000	200	Clear Lake	DeSoto
4/27/50..	DeSoto					4,000	50	4,000	50	Senator Roy	Lafayette
5/24/50..	Pointe Coupee	150	75			50	25	200	100	Cannon's Camp, Morganza	Pointe Coupee
5/25/50..	Pointe Coupee	300	150			100	50	400	200	Cannon's Camp, Morganza	Pointe Coupee
5/26/50..	Pointe Coupee	300	150			100	50	400	200	Cannon's Camp, Morganza	Pointe Coupee
5/27/50..	Pointe Coupee	150	75			50	25	200	100	Cannon's Camp, Morganza	Pointe Coupee
5/29/50..	Pointe Coupee	400	200					400	200	Bayou Rouge	Avoyelles
5/31/50..	Pointe Coupee	300	150			100	50	400	200	Weem's Lake	Rapides
6/ 1/50..	Pointe Coupee	300	150			100	50	400	200	Bayou Rouge	Avoyelles
6/ 2/50..	Pointe Coupee	300	150			100	50	400	200	Bayou Concordia	Rapides
6/ 5/50..	Pointe Coupee	400	200					400	200	Weem's Lake	Rapides
6/ 6/50..	Pointe Coupee	350	175					350	175	Indian Lake	Evangeline
6/ 7/50..	Pointe Coupee	200	100					200	100	False River	Pointe Coupee
6/12/50..	Pointe Coupee	175	85					175	85	False River	Pointe Coupee
6/13/50..	Pointe Coupee	200	100	200	100			400	200	Rep. L. Toups	Lafourche
6/14/50..	Pointe Coupee	500	250	40	20			540	270	West Fork, Calcasieu River	Calcasieu
6/15/50..	Pointe Coupee	350	175	50	25			400	200	A. J. Lambert	Beauregard
6/15/50..	Pointe Coupee	175	88	25	13			200	101	Cannon Lake	Pointe Coupee
6/16/50..	Pointe Coupee	325	163	75	38			400	201	J. C. Allen	Calcasieu
6/16/50..	Pointe Coupee	150	75	25	13			175	88	False River	Pointe Coupee
6/19/50..	Pointe Coupee	200	100	100	50			300	150	False River	Pointe Coupee
6/20/50..	Pointe Coupee	100	50	100	50			200	100	Cannon's Camp, Morganza	Pointe Coupee
6/21/50..	Pointe Coupee	500	250					500	250	Paxie Dupey	Calcasieu
6/21/50..	Pointe Coupee	500	250					500	250	Willis Larmand	Allen
6/22/50..	Pointe Coupee	500	250					500	250	Rep. J. M. Blanchet	Lafayette
6/22/50..	Pointe Coupee	500	250					500	250	Sheriff Aycock	St. Mary
6/26/50..	Pointe Coupee	400	200					400	200	J. P. Lewis	Jackson

FISH DISTRIBUTION—1950 (Continued)
Seining Crew No. 2—Ralph Briggs, Supervisor

BORROW PITS		WHITE PERCH		BASS		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
6/26/50	Pointe Coupee	400	200					400	200	False River	Pointe Coupee
6/27/50	Pointe Coupee	400	200					400	200	T. L. Johnston	Rapides
6/27/50	Pointe Coupee	400	200					400	200	False River	Pointe Coupee
6/28/50	Pointe Coupee	400	200					400	200	False River	Pointe Coupee
6/28/50	Pointe Coupee	400	200					400	200	Crazy Lake	Rapides
6/29/50	Pointe Coupee	400	200					400	200	C. H. Parker	Vernon
6/30/50	Pointe Coupee	200	100			100	50	300	150	Valentine Lake	Rapides
7/ 3/50	Pointe Coupee	200	100			200	100	400	200	Bayou Rouge	Avoyelles
7/ 3/50	Pointe Coupee	300	150					300	150	False River	Pointe Coupee
7/ 5/50	Pointe Coupee	200	100			200	100	400	200	Clear Bayou	Rapides
7/ 5/50	Pointe Coupee	300	150					300	150	False River	Pointe Coupee
7/ 6/50	Pointe Coupee	300	150					300	150	False River	Pointe Coupee
7/ 6/50	Pointe Coupee	200	100			200	100	400	200	Lake Sucess	Rapides
7/ 7/50	Pointe Coupee	200	100			200	100	400	200	Lake Success	Rapides
7/ 7/50	Pointe Coupee	300	150					300	150	Richards Lake	Pointe Coupee
7/10/50	Pointe Coupee	200	100			200	100	400	200	Rep. Walker	Grant
7/11/50	Pointe Coupee	200	100			200	100	400	200	Fish Creek	Grant
7/11/50	Pointe Coupee	200	100			200	100	400	200	Clear Bayou	Rapides
7/12/50	Pointe Coupee	150	75			150	75	300	150	Rep. Maxime Roy	Lafayette
7/12/50	Pointe Coupee	200	100			200	100	400	200	Anchor Lake	Bienville
7/13/50	Rapides	8,000	250			500	50	8,500	300	Camp Beauregard Lake	Rapides
7/17/50	Pointe Coupee	100	50					100	50	Bayou Rouge	Avoyelles
7/18/50	Pointe Coupee	400	200					400	200	B. W. Blackman Pond	Rapides
7/19/50	Pointe Coupee	400	200					400	200	Dr. Scott	Rapides
7/19/50	Pointe Coupee			50	25	150	75	200	100	Col. Friezell	Rapides
7/26/50	Catahoula	400	200					400	200	Saline Lake	Winn
7/27/50	Catahoula	400	200					400	200	W. Mouton	Allen
7/27/50	Catahoula	400	200					400	200	G. Martin Lake	Lafayette

FISH DISTRIBUTION—1950 (Continued)
Seining Crew No. 2—Ralph Briggs, Supervisor

BORROW PITS		WHITE PERCH		BASS		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
7/28/50	Catahoula	400	200					400	200	Brian Hawthorn	Rapides
7/28/50	Catahoula	400	200					400	200	Lake Paul	Rapides
7/31/50	Catahoula	400	200					400	200	Wallace Lake	Caddo
7/31/50	Catahoula	400	200					400	200	Smithport Lake	DeSoto
8/ 1/50	Catahoula	800	400					800	400	Jones Bayou	Catahoula
8/ 2/50	Catahoula	800	400					800	400	Wallace Lake	Caddo
8/ 3/50	Catahoula	400	200					400	200	Wallace Lake	Caddo
8/ 3/50	Catahoula	400	200					400	200	Saline Lake	Winn
8/ 4/50	Catahoula	400	200					400	200	Loyd Pitts	Allen
8/ 4/50	Catahoula	400	200					400	200	Ransbottom Lake	Rapides
8/ 9/50	Catahoula	400	200					400	200	Rep. Anderson	Vernon
8/ 9/50	Catahoula	400	200					400	200	Rep. Anderson	Vernon
8/10/50	Catahoula	400	200					400	200	L. B. Griffin	Beauregard
8/10/50	Catahoula	400	200					400	200	L. B. Griffin	Beauregard
8/11/50	Catahoula	400	200					400	200	Jones Bayou	Catahoula
8/11/50	Catahoula	400	200					400	200	Smithport Lake	DeSoto
8/15/50	Catahoula	800	400					800	400	California Lake	Catahoula
8/16/50	Catahoula	800	400					800	400	Saline Lake	Winn
8/17/50	Catahoula	800	400					800	400	Volman Lake	Caldwell
8/18/50	Catahoula	800	400					800	400	Black Lake	Winn
8/21/50	Catahoula	400	200					400	200	Wallace Lake	Caddo
8/23/50	Catahoula	800	400					800	400	Saline Lake	Winn
8/24/50	Catahoula	800	400					800	400	Rep. Walker	Grant
8/25/50	Catahoula	800	400					800	400	L. B' Griffin	Beauregard
8/28/50	Catahoula	400	400					400	400	Fish Creek	Grant
8/29/50	Catahoula	400	400					400	400	Rep. Walker	Grant
8/30/50	Federal Fish Hatchery					1,800	100	1,800	100	L. S. U.	East Baton Rouge
8/30/50	Catahoula	150	150					150	150	Saline Lake	Winn

FISH DISTRIBUTION—1950 (Continued)
Seining Crew No. 2—Ralph Briggs, Supervisor

BORROW PITS		WHITE PERCH		BASS		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
8/31/50	Catahoula	200	200					200	200	Saline Lake	Winn
9/ 5/50	Catahoula	400	400					400	400	Sandy Lake	Catahoula
9/ 6/50	Catahoula	400	400					400	400	Jones Bayou	Catahoula
9/ 7/50	Catahoula	200	200					200	200	Mill Pond	Caldwell
9/ 8/50	Catahoula	400	400					400	200	Chief of Police	St. Landry
9/11/50	Catahoula	200	200					200	200	Mill Pond	Caldwell
9/11/50	Catahoula	200	200					200	200	Chief of Police	St. Landry
9/12/50	Catahoula	400	400					400	400	Saline Lake	Winn
9/13/50	Catahoula	400	400					400	400	Senator P. Willis	Winn
9/14/50	Catahoula	200	200					200	200	Jones Bayou	Catahoula
9/15/50	Catahoula	200	200					200	200	Chief of Police	St. Landry
9/15/50	Catahoula	200	200					200	200	Elmer Walker	Grant
9/18/50	Catahoula	400	400					400	400	Sandy Lake	Catahoula
9/19/50	Catahoula	200	200					200	200	Calcasieu River	Allen
9/20/50	Catahoula	400	400					400	200	Calcasieu River	Allen
9/21/50	Catahoula	200	200					200	200	Calcasieu River	Allen
9/21/50	Catahoula	200	200					200	200	Crazy Lake	Rapides
9/22/50	Catahoula	200	200					200	200	Calcasieu River	Calcasieu
9/22/50	Catahoula	200	200					200	200	Jones Bayou	Catahoula
9/26/50	Catahoula	400	400					400	400	Calcasieu River	Calcasieu
9/27/50	Catahoula	400	400					400	400	Calcasieu River	Calcasieu
9/28/50	Catahoula	200	200					200	200	Mill Pond	Rapides
9/28/50	Catahoula	200	200					200	200	Jones Bayou	Catahoula
9/29/50	Catahoula	300	300					100	400	Saline Lake	Winn
10/ 2/50	Catahoula	400	400					400	400	Rep. Walker	Grant
10/ 3/50	Catahoula	400	400					400	400	Sandy Lake	Catahoula
10/ 4/50	Catahoula	200	200					200	200	Calcasieu River	Rapides
10/ 5/50	Catahoula	200	200					200	200	Steve Baker	Rapides

FISH DISTRIBUTION—1950 (Continued)
Seining Crew No. 2—Ralph Briggs, Supervisor

BORROW PITS		WHITE PERCH		BASS		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
10/ 5/50	Catahoula	200	200					200	200	Cocodrie's Bayou	Rapides
10/ 6/50	Catahoula					200	200	200	200	Cocodrie's Bayoyu	Rapides
10/ 9/50	Catahoula	100	100					100	100	Nugent Lake	Grant
10/ 9/50	Catahoula	100	100					100	100	Martin Shevnin	Grant
10/10/50	Catahoula	200	200					200	200	Whatley Lake	Lafayette
10/10/50	Catahoula	200	200					200	200	Morris Lake	LaSalle
10/10/50	Catahoula	200	200					200	200	Rep. A. J. Fortson	LaSalle
10/11/50	Catahoula	200	200					200	200	Taylor Lake	LaSalle
10/16/50	Catahoula	200	200					200	200	L. Prien	Calcasieu
10/16/50	Catahoula	200	200					200	200	West Fork Calcasieu River	Calcasieu
10/17/50	Catahoula	200	200					200	200	Moss Bluff, Calcasieu River	Calcasieu
10/18/50	Catahoula	200	200					200	200	West Fork Calcasieu River	Calcasieu
10/19/50	Catahoula	200	200					200	200	Houston River	Calcasieu
10/20/50	Catahoula	200	200					200	200	Moss Bluff, Calcasieu River	Calcasieu
10/23/50	Catahoula	200	200					200	200	Old River	Beauregard
10/24/50	Catahoula	200	200					200	200	Jones Bayou	Catahoula
10/25/50	Catahoula	200	200					200	200	Old River	Beauregard
10/26/50	Catahoula	200	200					200	200	Sabine River	Sabine
10/27/50	Catahoula	200	200					200	200	Old River	Beauregard
10/30/50	Catahoula	200	200					200	200	Rep. Anderson	Vernon
10/30/50	Catahoula	200	200					200	200	Mayor Stewart	Beauregard
10/31/50	Catahoula	400	400					400	400	Tew Lake	Catahoula
11/ 1/50	Catahoula	200	200					200	200	Crazy Lake	Rapides
11/ 1/50	Catahoula	200	200					200	200	Jones Bayou	Catahoula
11/ 2/50	Catahoula	200	200					200	200	Tew Lake	Catahoula
11/ 3/50	Catahoula	200	200					200	200	Sandy Lake	Catahoula
11/ 6/50	Catahoula	400	400					400	400	Calcasieu River	Allen
11/ 8/50	Catahoula	400	400					400	400	Mayor Stewart	Beauregard

FISH DISTRIBUTION—1950 (Continued)
Seining Crew No. 2—Ralph Briggs, Supervisor

BORROW PITS		WHITE PERCH		BASS		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
11/ 9/50	Catahoula	400	400					400	400	Calcasieu River	Rapides
11/10/50	Catahoula	400	400					400	400	Calcasieu River	Allen
11/13/50	Catahoula	200	200			200	200	400	400	Rep. Anderson	Vernon
11/14/50	Catahoula	200	200			200	200	400	400	Wallace Lake	Caddo
11/15/50	Catahoula	400	400					400	400	Sandy Lake	Catahoula
11/16/50	Catahoula	400	400					400	400	Tew Lake	Catahoula
11/17/50	Catahoula	200	200					200	200	Tew Lake	Catahoula
11/20/50	Catahoula	400	400					400	400	Tew Lake	Catahoula
11/21/50	Catahoula	400	400					400	400	Calcasieu River	Calcasieu
11/22/50	Catahoula	200	200					200	200	Fish Creek	Grant
11/22/50	Catahoula	200	200					200	200	Crazy Lake	Rapides
11/27/50	Catahoula					400	400	400	400	Rep. W. S. Cleveland	Acadia
11/28/50	Catahoula					400	400	400	400	Rep. W. S. Cleveland	Acadia
11/29/50	Catahoula	400	400					400	400	Senator G. W. Sockrider	Calcasieu
11/30/50	Catahoula	200	200					200	200	Sandy Lake	Catahoula
12/ 1/50	Catahoula					200	200	200	200	Rep. W. S. Cleveland	Acadia
12/ 4/50	Catahoula	200	200					200	200	Sieper Creek	Rapides
12/ 5/50	Catahoula	200	200					200	200	Rep. R. E. Walker	Grant
12/ 7/50	Catahoula	200	200					200	200	Jones Bayou	Catahoula
12/ 8/50	Catahoula	200	200					200	200	Rep. R. E. Walker	Grant
12/12/50	Beechwood Fish Hatchery			236	48	10,600	14	10,836	62	Calcasieu River	Allen
12/13/50	Beechwood Fish Hatchery			621	56	400	6	1,021	62	Calcasieu River	Allen
12/14/50	Beechwood Fish Hatchery			969	86			969	86	Calcasieu River	Calcasieu
12/15/50	Beechwood Fish Hatchery			356	37	6/200	24	6,556	61	Calcasieu River	Rapides
12/20/50	Beechwood Fish Hatchery			652	37	100	4	752	41	Calcasieu River	Allen
12/22/50	Beechwood Fish Hatchery			200	7	3,940	110	4,140	117	Vincent Reservoir	Allen
12/22/50	Beechwood Fish Hatchery			264	30	2,400	40	2,664	70	Calcasieu River	Rapides
	Total Crew No. 2	58,450	36,281	8,099	900	131,640	5,465	198,189	42,646		
	Total Crew No. 1	2,198,827	52,338	348,521	9,015	726,032	14,076	3,273,380	75,429		

FISH DISTRIBUTION—1951

Seining Crew No. 1—Jim C. Rhoads, Supervisor

BORROW PITS		WHITE PERCH		BASS		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
4/25/51	Tensas	275	125			600	100	875	225	Indian Lake	Madison
5/16/51	Ouachita	400	50	42	15	1,800	200	2,242	265	Wayne Lake	Ouachita
5/17/51	Tensas	500	200	21	11	400	150	921	361	Indian Lake	Madison
5/17/51	Tensas	375	140	19	15	450	160	844	315	Bear Lake	Madison
5/18/51	Tensas	2,000	100					2,000	100	Lake Bruin	Tensas
5/19/51	Tensas	200	100	35	35	500	200	735	335	Gray's Lake	Claiborne
5/23/51	Concordia	225	80			185	60	410	140	Lake St. John	Concordia
5/24/51	Concordia	300	150	11	14	21	16	332	180	Lake St. John	Concordia
5/28/51	Concordia	400	150	14	8	12	10	426	168	Lake St. John	Concordia
5/29/51	Tensas			400	150	4,000	600	4,400	750	Lake Bruin	Tensas
5/30/51	Concordia	250	100	21	12	300	75	571	187	Lake Concordia	Concordia
5/30/51	Ouachita	600	300	300	300	1,200	240	2,100	840	Chemin-a-Haut Lake	Morehouse
5/31/51	Concordia			200	40	1,800	350	2,000	390	Chemin-a-Haut	Morehouse
5/31/51	Concordia	600	250			50	40	650	290	Lake Concordia	Concordia
5/31/51	Ouachita	500	250	200	200	900	180	1,600	630	Bayou DeSiard	Ouachita
6/ 1/51	Ouachita	1,000	500	200	200	1,100	200	2,300	900	Phillip's Bayou	Ouachita
6/ 1/51	Ouachita	200	100	75	75	600	120	875	295	Bayou DeSiard	Ouachita
6/ 2/51	Ouachita	200	100	125	125	800	160	1,125	385	Phillip's Bayou	Ouachita
6/ 4/51	Ouachita	250	125	60	60	700	140	1,010	325	Bayou Bartholomew	Ouachita
6/ 6/51	Ouachita			151	68	1,600	300	1,751	368	Anacoco Dam	Vernon
6/ 6/51	Ouachita			98	72	1,400	275	1,498	347	Anacoco Dam	Vernon
6/ 7/51	Ouachita			48	40	900	200	948	240	School Pond	Grant
6/ 7/51	Ouachita			64	45	1,100	295	1,164	340	Thibodaux	Lafourche
6/ 8/51	Ouachita			72	30	1,200	250	1,272	280	Wall's Lake	Vernon
6/ 8/51	Ouachita			62	62	1,600	300	1,662	362	Girl's Scout Camp	Lincoln
6/11/51	Ouachita	400	100	72	60	1,400	300	1,872	460	Recreation Pond	Richland
6/11/51	Ouachita	300	125	44	38	800	100	1,144	263	Black Bayou	Ouachita
6/11/51	Ouachita	600	150	100	50	700	150	1,400	350	Cheniere Lake	Ouachita

FISH DISTRIBUTION—1951 (Continued)

Seining Crew No. 1—Jim C. Rhoads, Supervisor

BORROW PITS		WHITE PERCH		BASS		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
6/12/51	Ouachita	275	120	78	70	900	275	1,253	465	Garrett's Lake	Claiborne
6/12/51	Ouachita	200	70	82	60	1,100	320	1,382	450	Crew Lake	Richland
6/12/51	Ouachita	125	14	125	25	1,200	200	1,450	239	Bayou Bartholomew	Morehouse
6/13/51	Ouachita	150	60	98	65	1,400	300	1,648	425	Foursome Lake	Lincoln
6/13/51	Ouachita	200	60	42	38	800	200	1,042	298	Bayou Bartholomew	Morehouse
6/13/51	Ouachita			62	50	1,450	300	1,512	350	Bayou Bartholomew	Morehouse
6/13/51	Ouachita	60	15	85	20	1,200	125	1,345	160	Lake LaFouche	Richland
6/14/51	Morehouse	1,100	100					1,100	100	Horseshoe Lake	Morehouse
6/14/51	Morehouse	1,000	100					1,000	100	Chemin-a-Haut Lake	Morehouse
6/15/51	Ouachita	120	50	75	20	1,200	185	1,395	255	Black Bayou	Ouachita
6/16/51	Ouachita	200	35	100	20	1,000	120	1,300	175	Bayou Bartholomew	Morehouse
6/18/51	Ouachita	200	40	130	30	700	150	1,030	220	Cheniere Lake	Ouachita
6/19/51	Ouachita	300	60	160	40	800	175	1,260	275	Bayou DeSiard	Ouachita
6/20/51	Ouachita	175	30	60	20	600	175	835	225	Bayou DeSiard	Ouachita
6/26/51	Tensas	450	200	62	38			512	238	Lake Bruin	Tensas
6/27/51	Tensas	364	160	25	20	200	40	589	220	Lake Providence	East Carroll
6/28/51	East Carroll	600	400	31	40			631	440	Lake Providence	East Carroll
6/29/51	East Carroll	375	150	32	35	442	120	849	305	Indian Lake	Madison
7/ 5/51	Tensas	600	300	7	7	100	25	707	332	Bear Lake	Madison
7/ 5/51	Tensas			30	60	70	50	100	110	Federal Hatchery	Natchitoches
7/ 6/51	Tensas	275	200	8	16	40	20	323	236	Lake Bruin	Tensas
7/ 7/51	Tensas	600	400			431	100	1,031	500	Saddle Tree Lake	Tensas
7/ 9/51	Tensas	361	205	31	20	600	200	992	425	Lake Bruin	Tensas
7/ 9/51	Tensas			16	35	150	70	166	105	Federal Hatchery	Natchitoches
7/10/51	Tensas	400	275			150	50	550	325	Lake Louie	Catahoula
7/10/51	Tensas			11	18	150	70	161	88	Federal Hatchery	Natchitoches
7/11/51	Tensas	1,700	300					1,700	300	Lake Dean	Franklin
7/11/51	Tensas			16	30	310	150	326	180	Federal Hatchery	Natchitoches

FISH DISTRIBUTION—1951 (Continued)
Seining Crew No. 1—Jim C. Rhoads, Supervisor

BORROW PITS		WHITE PERCH		BASS		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
8/ 1/51	Federal Hatchery					1,500	240	1,500	240	La. State University	East Baton Rouge
8/ 2/51	Tensas	150	80	35	40	600	200	785	320	Kisatchie National Forest	Vernon
8/ 3/51	Tensas			33	42	700	220	733	262	Bundick's Creek	Beauregard
8/ 6/51	Tensas	100	75	37	40	600	200	737	315	Indian Lake	Madison
8/ 7/51	Tensas	240	40					240	40	Lake Bruin	Tensas
8/ 7/51	Tensas			44	50	700	275	744	325	Tangipahoa River	Tangipahoa
8/ 9/51	Tensas			46	50	1,000	240	1,046	290	Tangipahoa River	Tangipahoa
8/10/51	Tensas			37	45	1,100	300	1,137	345	Tangipahoa River	Tangipahoa
8/10/51	Tensas	100	60	185	360			285	420	Whiskey Chitto River	Allen
8/13/51	Tensas			3,600	75	1,400	40	5,000	115	Chicot Lake	Evangeline
8/14/51	Tensas			4,000	80	2,000	50	6,000	130	Lake Bistineau	Webster
8/15/51	Tensas	450	200	17	20	500	175	967	395	Chicot Lake	Evangeline
8/16/51	Tensas	600	175	21	25	225	100	846	300	Chicot Lake	Evangeline
8/17/51	Tensas	2,000	600	150	100	1,200	300	3,350	1,000	Lake Bruin	Tensas
8/18/51	Tensas	200	75	40	30	400	100	640	205	Cheniere Lake	Ouachita
8/21/51	Tensas	400	200	10	15	250	100	660	315	Lake Despair	Madison
8/22/51	Tensas	300	150	15	20	150	75	465	245	Lake Bruin	Tensas
8/23/51	Concordia	600	400	24	75	200	70	824	545	Lake Concordia	Concordia
8/24/51	Concordia	450	200	10	15			460	215	Lake St. John	Concordia
8/27/51	Concordia	375	200	26	35	400	160	801	395	Lake Bruin	Tensas
8/28/51	Concordia	200	100	54	100	500	150	754	350	Chicot Lake	Evangeline
8/29/51	Concordia	800	200	200	40	400	100	1,400	340	Lake Concordia	Concordia
8/30/51	Concordia	675	150	94	35	450	110	1,219	295	Lake Concordia	Concordia
9/ 5/51	Tensas			72	72	1,800	400	1,872	472	Lake Bruin	Tensas
9/ 5/51	Tensas			100	90	1,600	360	1,700	450	Saddle Tree Lake	Tensas
9/ 6/51	Tensas			62	50	1,400	300	1,462	350	Bear Lake	Madison
9/ 6/51	Tensas			12	30	900	200	912	230	Indian Lake	Madison
9/ 7/51	Tensas	800	400	32	25	400	100	1,232	535	Brown's Lake	Caldwell

FISH DISTRIBUTION—1951 (Continued)
Seining Crew No. 1—Jim C. Rhoads, Supervisor

BORROW PITS		WHITE PERCH		BASS		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
9/10/51	Tensas	350	200	47	60	600	200	997	460	Lake Providence	East Carroll
9/11/51	Tensas	600	300	42	50	500	175	1,142	525	Tangipahoa River	Tangipahoa
9/12/51	Tensas	400	225	38	48	600	200	1,038	473	Chemin-a-Haut	Morehouse
9/17/51	Madison	850	400	17	20			867	420	Bear Lake	Madison
9/18/51	Madison	900	450	22	25			922	475	Indian Lake	Madison
9/19/51	Madison	850	350	22	25	200	70	1,072	445	Wells Lake	Catahoula
9/20/51	Madison	900	450	27	35			927	485	Caney Lake	Webster
9/21/51	East Carroll	450	375	20	30			470	415	Lake Providence Lake	East Carroll
9/21/51	East Carroll	500	450	24	35			524	485	Lake Providence Lake	East Carroll
9/24/51	East Carroll	400	250	35	45	160	75	595	370	Verret Lake	Assumption
9/24/51	East Carroll	350	150	86	140	200	175	636	465	Lake Providence Lake	East Carroll
9/25/51	East Carroll	150	75	40	45	490	205	680	325	Lake Providence Lake	East Carroll
9/26/51	East Carroll	600	400	60	40	40	30	700	470	Kimball Bayou	Concordia
9/26/51	East Carroll	375	175	45	50	240	110	660	335	Lake Providence Lake	East Carroll
9/26/51	East Carroll	400	200	70	75	200	80	670	355	Kimball Bayou	Concordia
9/27/51	East Carroll	180	100	22	30	220	55	422	185	Lake Providence Lake	E. Carroll
9/27/51	East Carroll	650	375	40	45	20	15	710	435	Tangipahoa River	Tangipahoa
10/ 2/51	Ouachita	1,100	200	28	14	800	175	1,928	389	Robertson Lake	Richland
10/ 2/51	Ouachita	600	150	16	10	700	125	1,316	285	Clear Lake	Richland
10/ 3/51	East Carroll	600	200	20	20	300	50	920	270	Lake Providence Lake	East Carroll
10/ 4/51	East Carroll	400	350	36	40			436	390	Penal Farm	Caddo
10/ 5/51	East Carroll	350	225	35	40	600	150	985	415	Garretts	Claiborne
10/ 5/51	East Carroll	650	400	44	40			694	440	Horseshoe Lake	Morehouse
10/ 9/51	East Carroll	600	400					600	400	Royal Lake	Franklin
10/10/51	East Carroll	350	200					350	200	Lake Providence Lake	East Carroll
10/11/51	East Carroll	490	400					490	400	Bear Lake	Madison
10/11/51	East Carroll	475	425					475	425	Verret Lake	Assumption
10/12/51	East Carroll	300	200					300	200	Lake Providence Lake	East Carroll

FISH DISTRIBUTION—1951 (Continued)

Seining Crew No. 1—Jim C. Rhoads, Supervisor

BORROW PITS		WHITE PERCH		BASS		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
10/13/51	East Carroll	510	450					510	450	Ponchatoula River	Tangipahoa
10/15/51	East Carroll	400	250			175	40	575	290	Lake Providence	East Carroll
10/16/51	East Carroll					400	275	400	275	Loring Lake	Sabine
10/16/51	East Carroll	600	400					600	400	Lake Providence Lake	East Carroll
10/17/51	East Carroll	400	200			150	100	550	300	Lake Bruin	Tensas
10/18/51	East Carroll	550	350			40	30	590	380	Penal Farm	Caddo
10/19/51	East Carroll	672	300					672	300	Lake Bruin	Tensas
10/23/51	East Carroll	450	300			800	200	1,250	500	W. A. Mill's Lake	Ouachita
10/25/51	East Carroll	575	400	27	35			602	435	Dorcheat Bayou	Webster
10/25/51	East Carroll	630	450	19	30			649	480	Dorcheat Bayou	Webster
10/27/51	East Carroll	600	300					600	300	Kimballs Bayou	Concordia
10/27/51	East Carroll	450	200			125	40	575	240	Lake Bruin	Tensas
10/29/51	Tensas	450	275					450	275	Horseshoe Lake	Caldwell
10/29/51	Tensas			51	100			51	100	Federal Hatchery	Natchitoches
10/30/51	Tensas	700	400					700	400	Saddletree Lake	Tensas
10/31/51	Tensas	675	375					675	375	Robertson Lake	Richland
11/ 5/51	Tensas	400	150	24	20	200	40	624	210	Lake Bruin	Tensas
11/ 8/51	Tensas	600	400	12	15			612	415	Bear Lake	Madison
11/ 9/51	Tensas	400	400	24	30			424	430	Calcasieu River	Allen
11/10/51	Tensas	550	400	45	50			595	450	Robertson Lake	Richland
11/16/51	Monroe Fish Hatchery			141	100	12,375	49	12,516	149	Bayou DeSiard	Ouachita
11/16/51	Monroe Fish Hatchery			145	105	21,380	68	21,525	173	Clear Lake	Richland
11/16/51	Monroe Fish Hatchery			144	100	15,500	65	15,644	165	Bayou DeSiard	Ouachita
11/16/51	Monroe Fish Hatchery			71	55	20,400	64	20,471	119	Cheniere Break	Ouachita
11/16/51	Monroe Fish Hatchery			45	30	25,273	64	25,318	94	Bayou Bartholomew	Morehouse
11/17/51	Monroe Fish Hatchery			71	50	18,000	36	18,071	86	Cheniere Break	Ouachita
11/19/51	Monroe Fish Hatchery			86	60	20,000	40	20,086	100	Bayou Bartholomew	Morehouse
11/19/51	Monroe Fish Hatchery			92	70	22,000	44	22,092	114	Bayou Bartholomew	Morehouse

FISH DISTRIBUTION—1951 (Continued)
Seining Crew No. 1—Jim C. Rhoads, Supervisor

BORROW PITS		WHITE PERCH		BASS		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
11/19/51	Monroe Fish Hatchery			60	35	24,000	48	24,060	83	Black Bayou.	Ouachita
11/20/51	Monroe Fish Hatchery			86	55	30,400	84	30,486	139	Chemin-a-Haut	Morehouse
11/21/51	Monroe Fish Hatchery					25,000	50	25,000	50	Rogers Lake	Ouachita
11/21/51	Monroe Fish Hatchery			112	80	6,000	12	6,112	92	Long Lake	Caldwell
11/23/51	Monroe Fish Hatchery			24	18	10,200	12	10,224	50	Crew Lake	Richland
11/27/51	Monroe Fish Hatchery	650	70	1,250	50			1,900	120	Lake Bistineau	Webster
11/27/51	Monroe Fish Hatchery	650	70	1,252	50			1,902	120	Grant Lake	Ouachita
11/27/51	Monroe Fish Hatchery	700	75	1,200	60			1,900	135	McGuire's Lake	Ouachita
11/28/51	Monroe Fish Hatchery	200	15	1,200	60			1,400	75	Bayou D'Arbonne	Union
12/ 5/51	Lacombe Fish Hatchery			65	30			65	30	State Park	St. Tammany
12/ 7/51	Lacombe Fish Hatchery			1,000	200			1,000	200	Techefuncte River	St. Tammany
12/ 7/51	Lacombe Fish Hatchery			1,000	200			1,000	200	Abita River	St. Tammany
12/ 7/51	Lacombe Fish Hatchery			1,000	200			1,000	200	Tangipahoa River	Tangipahoa
12/ 7/51	Lacombe Fish Hatchery			1,000	200			1,000	200	Tickfaw River	St. Helena
12/ 8/51	Lacombe Fish Hatchery			1,200	210			1,200	210	Pushepatapa Creek	Washington
12/ 8/51	Lacombe Fish Hatchery			1,200	208			1,200	208	Bogue Chitto River	Washington

FISH DISTRIBUTION—1951 (Continued)
Seining Crew No. 1—Jim C. Rhoads, Supervisor

BORROW PITS		WHITE PERCH		BASS		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
12/ 8/51..	Lacombe Fish Hatchery....	....	....	1,000	180	....	....	1,000	180	Bogalusa River	Washington
12/ 8/51..	Lacombe Fish Hatchery....	....	....	1,200	207	....	....	1,200	207	Amite River	Livingston
12/13/51..	Lacombe Fish Hatchery....	....	....	1,800	180	....	....	1,800	180	Natalbany River	Livingston
12/13/51..	Lacombe Fish Hatchery....	....	....	900	95	....	....	900	95	Abita River	St. Tammany
12/13/51..	Lacombe Fish Hatchery....	....	....	900	95	....	....	900	95	Tchefuncte River	St. Tammany
12/13/51..	Lacombe Fish Hatchery....	....	....	900	90	....	....	900	90	12 Mile Creek	St. Helena
12/13/51..	Lacombe Fish Hatchery....	....	....	900	95	....	....	900	95	Darden Creek	St. Helena
12/13/51..	Lacombe Fish Hatchery....	....	....	1,800	180	....	....	1,800	180	Tangipahoa River	Tangipahoa
12/14/51..	Lacombe Fish Hatchery....	....	....	700	80	....	....	700	80	Tangipahoa River	Tangipahoa
12/14/51..	Lacombe Fish Hatchery....	....	....	1,900	200	....	....	1,900	200	Amite River	Livingston
12/17/51..	Lacombe Fish Hatchery....	....	....	1,800	200	....	....	1,800	200	State Park	St. Tammany
12/17/51..	Lacombe Fish Hatchery....	....	....	1,800	200	....	....	1,800	200	Tchefuncte River	St. Tammany
12/17/51..	Lacombe Fish Hatchery....	....	....	1,800	200	....	....	1,800	200	Tangipahoa River	Tangipahoa
12/18/51..	Lacombe Fish Hatchery....	....	....	1,800	200	....	....	1,800	200	Darden Creek	St. Helena
12/18/51..	Lacombe Fish Hatchery....	....	....	1,800	200	....	....	1,800	200	Amite River	Livingston
	Total..................	54,292	23,724	47,278	9,921	319,174	16,327	420,744	49,972		

FISH DISTRIBUTION—1951 (Continued)
Seining Crew No. 2—Ralph Briggs, Supervisor

BORROW PITS		WHITE PERCH		BASS		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
1/ 4/51	Beechwood Fish Hatchery			166	90			166	90	Calcasieu River	Allen
1/ 4/51	Beechwood Fish Hatchery			62	33	20	5	82	38	Calcasieu River	Rapides
1/ 5/51	Beechwood Fish Hatchery			1,693	71	2,450	27	4,143	98	Calcasieu River	Allen
1/ 5/51	Beechwood Fish Hatchery			1,800	54	5,300	37	7,100	91	Calcasieu River	Rapides
1/ 6/51	Beechwood Fish Hatchery			600	15	11,300	76	11,900	91	Calcasieu River	Rapides
1/ 6/51	Beechwood Fish Hatchery			200	5	9,700	62	9,900	67	Calcasieu River	Allen
1/10/51	Catahoula					200	200	200	200	Fish Lake	Grant
1/10/51	Catahoula					200	200	200	200	Saline Lake	Winn
1/15/51	Catahoula					200	200	200	200	Saline Lake	Winn
1/17/51	Catahoula					200	200	200	200	Calcasieu River	Rapides
1/19/51	Catahoula					175	175	175	175	Calcasieu River	Allen
1/22/51	Catahoula					200	200	200	200	Tew Lake	Catahoula
1/24/51	Catahoula					200	200	200	200	Calcasieu River	Allen
1/24/51	Catahoula					100	150	100	150	Reservoir	Plaquemines
1/26/51	Catahoula					200	200	200	200	Calcasieu River	Rapides
1/29/51	Catahoula					100	150	100	150	Old River	Beauregard
1/30/51	Catahoula					100	150	100	150	Saline Lake	Winn
2/ 5/51	Catahoula					200	300	200	300	Anacoco Lake	Vernon
2/ 6/51	Catahoula					100	150	100	150	Calcasieu River	Allen
2/ 7/51	Catahoula					100	150	100	150	Knox Lake	Claiborne
2/12/51	Catahoula					100	150	100	150	Tew Lake	Catahoula
2/12/51	Catahoula					100	150	100	150	Jones Bayou	Catahoula
2/14/51	Catahoula					100	150	100	150	Sandy Lake	Catahoula
2/16/51	Catahoula					100	150	100	150	Jones Bayou	Catahoula
2/16/51	Catahoula					100	150	100	150	Tew Lake	Catahoula
2/19/51	Catahoula					200	300	200	300	Concordia Lake	Rapides
2/21/51	Catahoula					150	225	150	225	Cathey Lake	Grant
2/23/51	Catahoula					150	225	150	225	Sunnyvale Lake	Rapides

FISH DISTRIBUTION—1951 (Continued)
Seining Crew No. 2—Ralph Briggs, Supervisor

BORROW PITS		WHITE PERCH		BASS		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
2/26/51	Catahoula					200	150	200	150	Valentine Lake	Rapides
2/28/51	Catahoula					200	150	200	150	Mill Pond	Rapides
3/ 2/51	Catahoula					150	200	150	200	Fish Creek	Grant
3/ 5/51	Catahoula	150	200					150	200	Big Creek	Grant
3/ 7/51	Catahoula	150	200					150	200	Tew Lake	Catahoula
3/12/51	Catahoula					100	100	100	150	Big Creek	Grant
3/16/51	Catahoula					100	150	100	150	Tew Lake	Catahoula
3/19/51	Catahoula					100	150	100	150	Jones Bayou	Catahoula
3/23/51	Catahoula					100	150	100	150	Gray's Creek	Claiborne
3/30/51	Catahoula					100	150	100	150	Gray's Creek	Claiborne
6/11/51	Catahoula	125	125	100	38	100	38	325	201	Rapides Lake	Rapides
6/11/51	Catahoula	150	150	100	38	100	38	350	226	Cocodria Lake	Rapides
6/12/51	Catahoula	100	100	100	38	100	38	300	176	Lake Margaret	Rapides
6/13/51	Catahoula					200	200	200	200	Leighton Pond	Lafourche
6/13/51	Catahoula	175	175	50	19	50	19	275	213	Urania Lake	Winn
6/13/51	Catahoula					200	200	200	200	Blue Lake	Sabine
6/14/51	Catahoula			100	38	250	188	350	226	Tew Lake	Catahoula
6/15/51	Catahoula	200	75			200	75	400	150	Jones Bayou	Catahoula
6/18/51	Rapides					400	400	400	400	Calcasieu River	Rapides
6/19/51	Rapides					400	400	400	400	Calcasieu River	Allen
6/20/51	Rapides					400	400	400	400	Calcasieu River	Allen
6/21/51	Rapides					400	400	400	400	Calcasieu River	Rapides
6/22/51	Rapides					400	400	400	400	Seiper Creek	Rapides
6/25/51	Catahoula	150	150	50	20	50	18	250	188	Sugar Lake	Vernon
6/26/51	Catahoula					200	200	200	200	Anacoco Lake	Vernon
6/27/51	Catahoula	300	300	45	45	125	60	470	405	Saline Lake	Winn
6/28/51	Catahoula	75	75			150	118	225	193	Tew Lake	Catahoula
6/29/51	Catahoula	75	75	20	20	125	93	220	188	Calcasieu River	Allen

FISH DISTRIBUTION—1951 (Continued)
Seining Crew No. 2—Ralph Briggs, Supervisor

BORROW PITS		WHITE PERCH		BASS		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
7/ 2/51	Catahoula	100	100	50	30	50	18	200	148	Iatt Lake	Grant
7/ 2/51	Catahoula	150	150	50	30	50	18	250	198	Iatt Lake	Grant
7/ 3/51	Catahoula	100	100	100	10	100	35	300	175	Jones Bayou	Catahoula
7/ 5/51	Catahoula	300	300	50	18	100	35	150	353	Iatt Lake	Grant
7/ 6/51	Catahoula	100	100	50	18	50	50	200	168	Calcasieu River	Allen
7/ 9/51	Catahoula			50	50	150	150	200	200	Smithport Lake	DeSoto
7/ 9/51	Catahoula	150	150	20	15	50	17	220	182	Fish Creek	Grant
7/10/51	Catahoula	150	150			125	60	275	210	Fish Creek	Grant
7/11/51	Catahoula			200	75	100	37	300	112	Tew Lake	Catahoula
7/11/51	Catahoula	100	100	50	17	100	35	250	152	Jones Bayou	Catahoula
7/12/51	Catahoula	100	100			100	100	200	200	Tew Lake	Catahoula
7/13/51	Catahoula	100	100			100	67	200	167	St. Joseph's Lake	Rapides
7/25/51	Catahoula					200	200	200	200	Tew Lake	Catahoula
7/26/51	Catahoula			75	25	350	320	425	345	Tew Lake	Catahoula
7/27/51	Catahoula	100	100			100	100	200	200	Jones Bayou	Catahoula
8/ 6/51	Catahoula	100	100			100	100	200	200	Tew Lake	Catahoula
8/ 7/51	Catahoula	100	100			100	100	500	200	Capps Pond	Grant
8/ 8/51	Catahoula	500	75			500	75	1,000	150	Tew Lake	Catahoula
8/ 9/51	Catahoula			200	50	500	75	200	125	Jones Bayou	Catahoula
8/10/51	Catahoula	100	100	200	50	400	60	700	210	Tew Lake	Catahoula
8/13/51	Catahoula	150	150	100	30	200	25	450	205	Tew Lake	Catahoula
8/14/51	Catahoula	300	100	100	30	400	50	800	180	Tew Lake	Catahoula
8/15/51	Catahoula	150	150	50	15	200	25	400	190	Fullerton Lake	Vernon
8/15/51	Catahoula	150	150	50	15	200	25	400	190	Jones Bayou	Catahoula
8/16/51	Catahoula	300	150	100	30	200	25	600	205	Chicot Lake	Evangeline
8/17/51	Catahoula	150	150	100	30	200	25	450	205	Chicot Lake	Evangeline
8/17/51	Catahoula	300	150	100	30	200	25	600	205	Tew Lake	Catahoula
8/20/51	Catahoula	150	150	50	25	100	25	300	200	Iatt Lake	Grant

FISH DISTRIBUTION—1951 (Continued)
Seining Crew No. 2—Ralph Briggs, Supervisor

BORROW PITS		WHITE PERCH		BASS		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
8/21/51	Catahoula	100	100	50	25	200	50	350	175	Hemphill Lake	Catahoula
8/21/51×	Catahoula					200	200	200	200	Gillespie Bayou	Catahoula
8/22/51	Catahoula	150	150	50	25	100	25	300	200	Fullerton Lake	Vernon
8/22/51	Catahoula					200	200	200	200	Gillespie Bayou	Catahoula
8/23/51	Catahoula			50	25	200	125	250	150	Big Creek	Grant
8/27/51	Catahoula	150	150	50	25	100	25	300	200	Bayou Pierre	DeSoto
8/28/51	Catahoula	150	150	50	25	100	25	300	200	Fullerton Lake	Vernon
8/29/51	Catahoula	100	150	25	15	150	40	325	205	Big Creek	Grant
8/30/51	Catahoula	125	125	50	25	150	40	325	190	Iatt Lake	Grant
9/ 4/51	Catahoula	150	150	50	25	100	25	300	200	Chicot Lake	Evangeline
9/ 5/51	Catahoula					400	400	400	400	Lake Bistineau	Webster
9/ 6/51	Catahoula			50	15	200	200	250	215	Bayou Pierre	DeSoto
9/ 7/51	Catahoula					200	200	200	200	Bayou Pierre	DeSoto
9/10/51	Catahoula			50	25	350	175	400	200	Tew Lake	Catahoula
9/10/51	Catahoula			50	25	350	175	400	200	Iatt Lake	Grant
9/11/51	Catahoula	100	100	50	25	300	75	450	200	Big Lake	Grant
9/12/51	Catahoula	100	100			100	100	200	200	Lake Bistineau	Webster
9/12/51	Catahoula	100	100	50	25	300	75	450	200	Cocodria Lake	Rapides
9/13/51	Catahoula	100	100			100	100	200	200	Tew Lake	Catahoula
9/13/51	Catahoula	100	100	50	25	300	75	450	200	Jones Bayou	Catahoula
9/14/51	Catahoula					200	200	200	200	Saline Lake	Winn
9/17/51	Catahoula	150	150	50	25	100	25	300	200	Sabine River	Beauregard
9/17/51	Catahoula	100	100	50	25	75	75	225	200	Old River	Beauregard
9/18/51	Catahoula	150	150	50	25	100	25	300	200	Catahoula Lake	LaSalle
9/19/51	Catahoula	150	150	50	25	100	25	300	200	Big Creek	Grant
9/10/51	Catahoula	100	100	50	25	200	50	350	175	Anacoco Lake	Vernon
9/21/51	Catahoula	100	100			100	100	200	200	Jones Bayou	Catahoula
9/22/51	Catahoula	150	150	50	25	100	25	300	200	Tew Lake	Catahoula

FISH DISTRIBUTION—1951 (Continued)
Seining Crew No. 2—Ralph Briggs, Supervisor

BORROW PITS		WHITE PERCH		BASS		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
9/25/51..	Catahoula...............	150	150	50	25	200	25	400	200	Maryhill Lake	Rapides
9/25/51..	Catahoula...............	150	150	50	25	200	25	400	200	Taylor Lake	LaSalle
9/26/51..	Catahoula...............	150	150	50	25	200	25	400	200	Catahoula Lake	LaSalle
9/26/51..	Catahoula...............	150	150	50	25	200	25	400	200	Whatley Lake	LaSalle
9/27/51..	Catahoula...............	150	150	50	25	150	25	350	200	LaSalle Lake	LaSalle
9/28/51..	Catahoula...............	150	150	50	25	150	25	350	200	Leray Lake	Vernon
9/29/51..	Catahoula...............	150	150	50	25	150	25	350	200	McArthur Lake	Rapides
10/ 8/51..	Catahoula...............	150	150	50	25	200	25	400	200	Iatt Lake	Grant
10/ 9/51..	Catahoula...............	150	150	50	25	200	25	400	200	Fleming's Lake	Grant
10/10/51..	Catahoula...............	150	150	50	50	200	25	400	225	Iatt Lake	Grant
10/11/51..	Catahoula...............	100	100	....	....	275	100	375	200	Anacoco Lake	Vernon
10/12/51..	Catahoula...............	100	100	....	....	275	100	375	200	Saline Lake	Winn
10/15/51..	Catahoula...............	100	100	200	50	400	50	700	200	Valentine Lake	Rapides
10/16/51..	Catahoula...............	50	50	....	....	150	150	200	200	Smithport Lake	DeSoto
10/17/51..	Catahoula...............	100	100	200	50	300	50	600	200	Big Creek	Grant
10/18/51..	Catahoula...............	100	100	200	50	50	50	350	200	Lake Success	Rapides
10/19/51..	Catahoula...............	150	150	100	25	200	25	450	200	Fish Creek	Grant
10/22/51..	Catahoula...............	50	50	....	....	150	150	200	200	Tew Lake	Catahoula
10/23/51..	Catahoula...............	100	100	....	....	100	100	200	200	Jones Bayou	Rapides
10/24/51..	Catahoula...............	100	100	100	25	400	75	600	200	Magnolia Lake	LaSalle
10/25/51..	Catahoula...............	100	100	....	....	500	100	600	200	Iatt Lake	Grant

FISH DISTRIBUTION—1951 (Continued)
Seining Crew No. 2—Ralph Briggs, Supervisor

BORROW PITS		WHITE PERCH		BASS		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
11/ 5/51	Catahoula	150	150	50	25	200	25	400	200	Calcasieu River	Rapides
11/ 6/51	Catahoula	100	100			450	100	550	200	Fish Creek	Grant
11/ 7/51	Catahoula	100	100	100	25	75	75	275	200	Calcasieu River	Calcasieu
11/ 7/51	Catahoula	150	150			225	50	375	200	Calcasieu River	Calcasieu
11/ 8/51	Catahoula	150	150	50	25	200	25	400	200	Calcasieu River	Allen
11/ 8/51	Catahoula	25	25	50	25	200	25	275	75	Cypress Lake	LaSalle
11/ 9/51	Catahoula	150	150			50	50	200	200	Tew Lake	Catahoula
11/ 9/51	Catahoula	100	50			500	150	600	200	Jones Bayou	Rapides
11/12/51	Catahoula	150	150	50	25	200	25	400	200	Anacoco Lake	Vernon
11/13/51	Catahoula	50	50	100	100	400	50	550	200	Saline Lake	Winn
11/14/51	Catahoula	100	100			100	100	200	200	Tew Lake	Catahoula
11/14/51	Catahoula	100	100			275	100	375	200	Tew Lake	Catahoula
11/19/51	Catahoula	150	150	100	25	200	25	450	200	Anacoco Lake	Vernon
11/20/51	Catahoula	100	100			100	100	200	200	Saline Lake	Winn
11/21/51	Catahoula	100	100	200	50	50	50	350	200	Tew Lake	Catahoula
11/23/51	Catahoula	50	50			325	150	375	200	Iatt Lake	Grant
11/26/51	Catahoula	100	100			100	100	200	200	Saline Lake	Winn
11/27/51	Catahoula	100	100	50	25	75	75	225	200	Tew Lake	Catahoula
11/28/51	Catahoula	150	150			225	50	375	200	Jones Bayou	Catahoula
11/29/51	Catahoula	100	100			100	100	200	200	Sandy Lake	Catahoula
11/30/51	Catahoula	100	100	50	25	250	75	400	200	Saline Lake	Winn
12/ 3/51	Beechwood Fish Hatchery			329	60	175	3	504	63	Calcasieu River	Allen

FISH DISTRIBUTION—1951 (Continued)
Seining Crew No. 2—Ralph Briggs, Supervisor

BORROW PITS		WHITE PERCH		BASS		OTHER		TOTAL		DISTRIBUTION	PARISH
Date	Parish	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
12/ 4/51	Beechwood Fish Hatchery			1,735	90			1,735	90	Calcasieu River	Allen
12/ 5/51	Beechwood Fish Hatchery			480	70	150	5	630	75	Calcasieu River	Calcasieu
12/ 6/51	Beechwood Fish Hatchery			1,456	90			1,456	90	Calcasieu River	Allen
12/12/51	Beechwood Fish Hatchery			1,404	77			1,404	77	Sandy Lake	Catahoula
12/12/51	Beechwood Fish Hatchery			700	62	740	8	1,440	70	Calcasieu River	Allen
12/12/51	Beechwood Fish Hatchery			790	30	1,650	60	2,440	90	Calcasieu River	Rapides
12/13/51	Beechwood Fish Hatchery			1,065	35	1,750	65	2,815	100	Calcasieu River	Rapides
12/13/51	Beechwood Fish Hatchery			2,100	90			2,100	90	Calcasieu River	Rapides
12/13/51	Beechwood Fish Hatchery			875	40			875	40	Calcasieu River	Allen
12/17/51	Beechwood Fish Hatchery			1,433	90			1,433	90	Calcasieu River	Calcasieu
12/17/51	Beechwood Fish Hatchery			1,200	60			1,200	60	Anacoco Lake	Vernon
12/18/51	Beechwood Fish Hatchery			1,606	90			1,606	90	Bayou Pierre	DeSoto
12/19/51	Beechwood Fish Hatchery			765	40	2,250	50	3,015	90	Lake Larto	Catahoula
12/19/51	Beechwood Fish Hatchery			765	40	2,250	50	3,015	90	Pollock Air Base	Grant
	Total Crew No. 2	12,750	11,750	26,609	3,416	65,360	16,640	104,719	31,806		
	Total Crew No. 1	54,292	23,724	47,278	9,921	319,174	16,327	420,744	49,972		
	Total 1951	67,042	35,474	73,887	13,337	384,534	32,967	525,463	81,778		

LAKE BRUIN FISH PRESERVE

CATCH AND LICENSES

	SPECIES		LICENSES	
MONTH, 1950	**Bass**	**Crappie**	**Rsident**	**Nonrsident**
January	698	273	78	45
February	822	483	94	69
March	1,248	857	132	113
April	1,468	1,377	195	132
May	1,497	1,699	193	174
June	1,605	2,895	207	245
July	1,973	2,716	265	283
August	1,442	2,224	200	206
September	1,651	1,350	184	177
October	1,832	1,406	202	142
November	1,090	1,329	145	108
December	716	370	63	55
Total, 1950	16,042	16,979	1,958	1,749
1951				
January	890	720	105	79
February	862	547	113	73
March	1,244	1,520	175	126
April	1,374	2,235	223	171
May	2,105	3,896	307	302
June	1,431	1,955	235	222
July	1,393	1,337	288	226
August	1,279	1,460	215	186
September	2,166	1,554	256	210
October	1,419	1,766	211	162
November	818	1,191	156	102
December	777	814	104	62
Total, 1951	15,758	18,996	2,388	1,921

The water hyacinth program had to be severely cut due to lack of appropriation. With only $75,000 appropriated, it was necessary to curtail the program to a maintenance patrol basis in order to hold the areas cleared up to 1950. Through 1950 and 1951 a greatly reduced crew has kept these areas cleared of water hyacinth. It is earnestly requested that the 1952 Legislature appropriate the necessary funds for the continual maintenance patrol and for a resumption of this very vital project so that the water hyacinth can be destroyed through the remainder of the state.

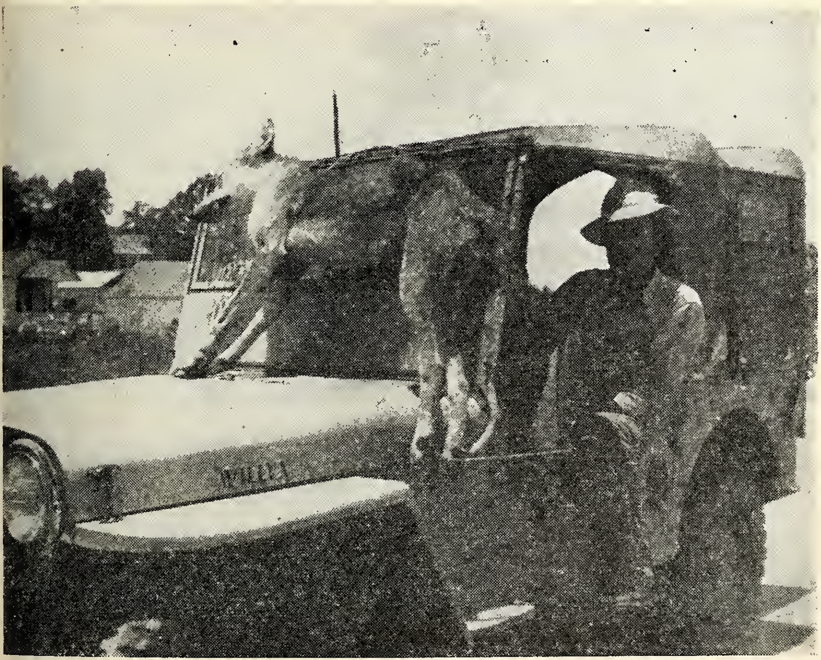
The Predator Control Section has continued its effective program. Whenever and wherever our predators have gotten out of balance, the predator trappers have moved in and corrected the condition. Wolves, foxes and all predators are kept in check. Many beaver, especially in the Florida parishes, have been live-

"Doc" Harris (left) and Joe Miller, chief of predator control unit setting out traps.

Joe Miller left, Mr. Bobie Byrns, Winnfield Motor Co. right. Looking at the 73 lb. black wolf in trap.

trapped and removed to areas along our major river basins and in our refuges where they cannot continue their damage to crops and growing timber.

The sanctuary on Catahoula Lake during the season of 1950 provided a resting area for the ducks and geese which held, at the height of the migratory waterfowl migration, approximately a half million ducks and geese. Although the lake never went dry during the summer of 1950, there was enough food left from the previous years so that the ducks and geese did very well. The season of 1951 finally produced an excellent growth both of chufa and wild millet but unfortunately the lake stayed dry way into the duck season; at the very end of the duck season the rains came and the lake rose to a height that precluded any of the mallards and pintails from being able to reach the food and so, except for a few diving ducks, there was very little shooting on Catahoula Lake this season. The duck hunters of Catahoula Lake should remember that this is the first year in twenty-seven years that those conditions prevailed and in ordi-



"Doc" Harris of the predator control unit with huge wolf he trapped.

This picture shows the stand of wild millet at the head of Lake Catahoula during the late summer months.

The dry lake bed of Catahoula Lake during the summer dry period showing the caked and cracked condition of the bottom.

nary years the lake has sufficient water in the early part of November to stop and hold the big migrations that come through at that time of the year. If Louisiana has a very late season, the duck hunters of Catahoula Lake can expect high water, particularly during the latter half of December and through January.

Each year must bring to all of us the realization that only a constant and determined program for the wildlife resources of this state will perpetuate the hunting and fishing for the future generations. The steady and relentless drainage, the terrific change in land use that has taken nearly two million acres out of food crops for quail and put these lands into pastures, the greatly increased numbers of hunters and fishermen and the greatly increased ability of all hunters and fishermen to reach every place in the state, has produced and will continue to produce a tremendous task for this Department. The sympathetic appreciation of all of our people will make this program possible.

FEDERAL AID IN WILDLIFE RESTORATION

(Pittman-Robertson)

REPORT OF PROGRESS

1950-51

Prepared by

JOHN S. CAMPBELL

State Coordinator, Federal Aid

In preparing this report, it is essential that a concise account be presented on each of the existing projects and those terminated during the biennium so as to emphasize the full value of the program. To do this, each activity under its respective heading is treated by outlining procedure, compiling data and suggesting recommendations. Adequate charts, graphs, tables and maps have been provided to simplify the contents.

As it is a basic requirement that all Federal-Aid projects be of substantial character and design, it becomes necessary that they be listed under one of the five groups as follows:

(1) Coordination
(2) Land development
(3) Investigation and surveys
(4) Maintenance
(5) Land acquisition

Activities for this biennium have been confined to four of this group; namely, (1) coordination, (2) land development, (3) investigations and surveys, (4) land acquisition (by lease).

COORDINATION

PROJECT 10-C, STATE COORDINATION

Coordinator: John S. Campbell
Assistant Coordinator: Lyle S. St. Amant

The coordination project has been in existence since 1946 and due to the phenomenal growth of the Federal-Aid program since that date it has become necessary that an assistant project leader be added to the project. An assistant was added July 1, 1951. This project will continue as long as there is justification for it.

The coordination project is responsible to the Department for the efficient management affecting an over-all wildlife restoration program. Its primary function is to coordinate all activities under Federal Aid so as to obtain the best results and receive the greatest benefit from monies spent.

During 1948-49 there were fourteen projects in existence, four research, nine development and the coordination project. Since that date one of the research projects has been completed. This project, 8-R (wildlife inventory and management), is in the process of being published. Projects 1-R (fur resources management) and 3-R (wild turkey investigation) were completed prior to this biennium and published in 1950. One of the development projects, 14-D (deer trapping and transplanting), has been completed and the final report is now ready for publication. Projects 12-D, 16-D, 18-D, 19-D, 20-D, 21-D and 22-D have been combined into a master project 23-D (development of wildlife management areas). Project 15-R (mourning dove study), 17-R (migratory waterfowl investigation), 6-D (farm game habitat improvement), and 10-C (coordination) are still in existence. During this biennium one research project, 24-R (evaluation of wildlife management practices in Louisiana), has been added.

Projects in existence during this biennium are as follows:

Number and Name	**1950-1951**	**1951-1952**
1-R, fur resources management	—	—
3-R, present status of the wild turkey in Louisiana	2,639.55	—
6-D, farm game habitat improvement	37,584.91	41,264.00
8-R, wildlife inventory and management	9,596.61	—
10-C, coordination	15,107.81	28,355.00
14-D, deer trapping and transplanting	30,524.68	—
15-R, mourning dove study	14,885.89	19,105.50
17-R, migratory waterfowl investigation	9,361.36	22,330.00
23-D, development of wildlife management areas	92,480.46	166,254.00
24-R, evaluation of wildlife management practices in Louisiana	6,102.07	10,839.00
	218,283.34	288,148.00

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* Outlay of cost was published in 1948-49 Biennium Report.

To expedite the progress of this project and to coordinate the activities of other projects, a program has been provided whereby responsibilities and duties have been delegated to project personnel. The over-all program has been arranged into two categories, namely: (1) land acquisition, development and management, C. J. Perkins in charge; (2) and research and surveys studies, Dr. Lyle S. St. Amant in charge. In this manner the functions of the projects are channelled through the two major phases of the work and are under constant supervision of field personnel.

The fiscal phase of the coordination project is administrated by an accountant with an assistant who is responsible for accurate disbursement of funds and for preparing reimbursement and management, C. J. Perkins in charge; and (2) re- and payroll for all project personnel. A full-time secretary is assigned to the project to handle correspondence, filing and miscellaneous details.

The volume of work assigned to coordination is constantly expanding because of increased annual allocations of Federal funds and demands for more management and development work throughout the State.

INVESTIGATIONS AND SURVEYS

Supervisor: Lyle S. St. Amant

PROJECT 1-R, PUBLICATION

(Fur Resources Management Investigation)

Supervisor of Publication: Lyle S. St. Amant

PROJECT 3-R, PUBLICATION

(Wild Turkey Investigation)

Supervisor of Publication: Lyle S. St. Amant

PROJECT 8-R, STATE-WIDE WILDLIFE INVENTORY AND MANAGEMENT PLAN

Leader: Lyle S. St. Amant

PROJECT 15-R, MOURNING DOVE STUDY

Leader: John D. Newsome

Assistant: J. B. Kidd

PROJECT 17-R, MIGRATORY WATERFOWL INVESTIGATION

Leader: Richard K. Yancey

Assistant: Morton M. Smith

PROJECT 24-R, EVALUATION OF WILDLIFE MANAGEMENT PRACTICE IN LOUISIANA

Leader: Raymond D. Moody*

Leader: Jack O. Collins

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* Entered the Armed Services in 1951.

PROJECT 1-R, PUBLICATION OF FUR RESOURCES MANAGEMENT INVESTIGATION

Project 1-R, an investigation of fur resources and management, was carried out under the leadership of Mr. Ted O'Neil between 1941-1946. In 1948 and 1949 the final report was approved for publication and the manuscript was then edited and published under the supervision of the writer. The resulting publication was a cloth-bound volume of 160 pages with 61 illustrations, 55 plates, 5 black-and-white maps and diagrams, and one large colored vegetation-type map of the Louisiana coast. The title of the book is *The Muskrat in the Louisiana Coastal Marshes.*

An initial printing of 3,000 copies was received in April, 1950. During the past two years, copies have been placed in all libraries and most high schools and colleges over the state. Demand for this publication by professional personnel, marshland owners, and students has been exceptional. Free copies have been furnished to many U. S. Fish and Wildlife Service personnel, numerous state game and fish personnel over the United States, game management students, and university faculty in many parts of the country. The general reception of this book by the members of the game management profession and the use of it by game management students and faculty members indicates that it has filled a need in the field of fur management. Remaining copies of this publication are available to the public at the Louisiana Department of Wild Life and Fisheries offices.

PROJECT 3-R, PUBLICATION OF WILD TURKEY INVESTIGATION

Project 3-R, an investigation of wild turkey conditions in Louisiana, was initiated in 1941 but was interrupted for three years during the war. In 1946, it was reopened and the field work was completed by the end of 1947. A final report was submitted for approval during 1948. The first part of this study was carried out in 1941-1942 by Dr. George H. Bick, now professor of zoology at Tulane University. The latter part of the investigation was carried out by Mr. F. D. Hollis, Federal-Aid biologist, who also wrote the final report from which the publication was prepared.

In 1950, the final report was approved for publication and it was edited and submitted to the printer by the writer during the same year. The resulting booklet consists of 78 pages and

42 illustrations. The title of the publication is *The Present Status of the Wild Turkey in Louisiana.* Three thousand copies were printed and have been available to the public since 1950. Most libraries, many schools, and universities have been furnished with copies.

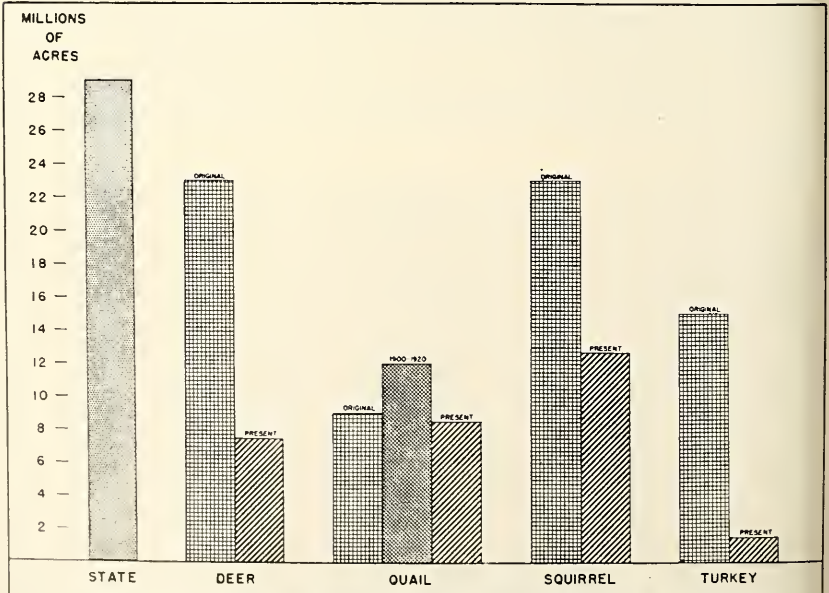
PROJECT 8-R, WILDLIFE INVENTORY AND MANAGEMENT PLAN

Introduction

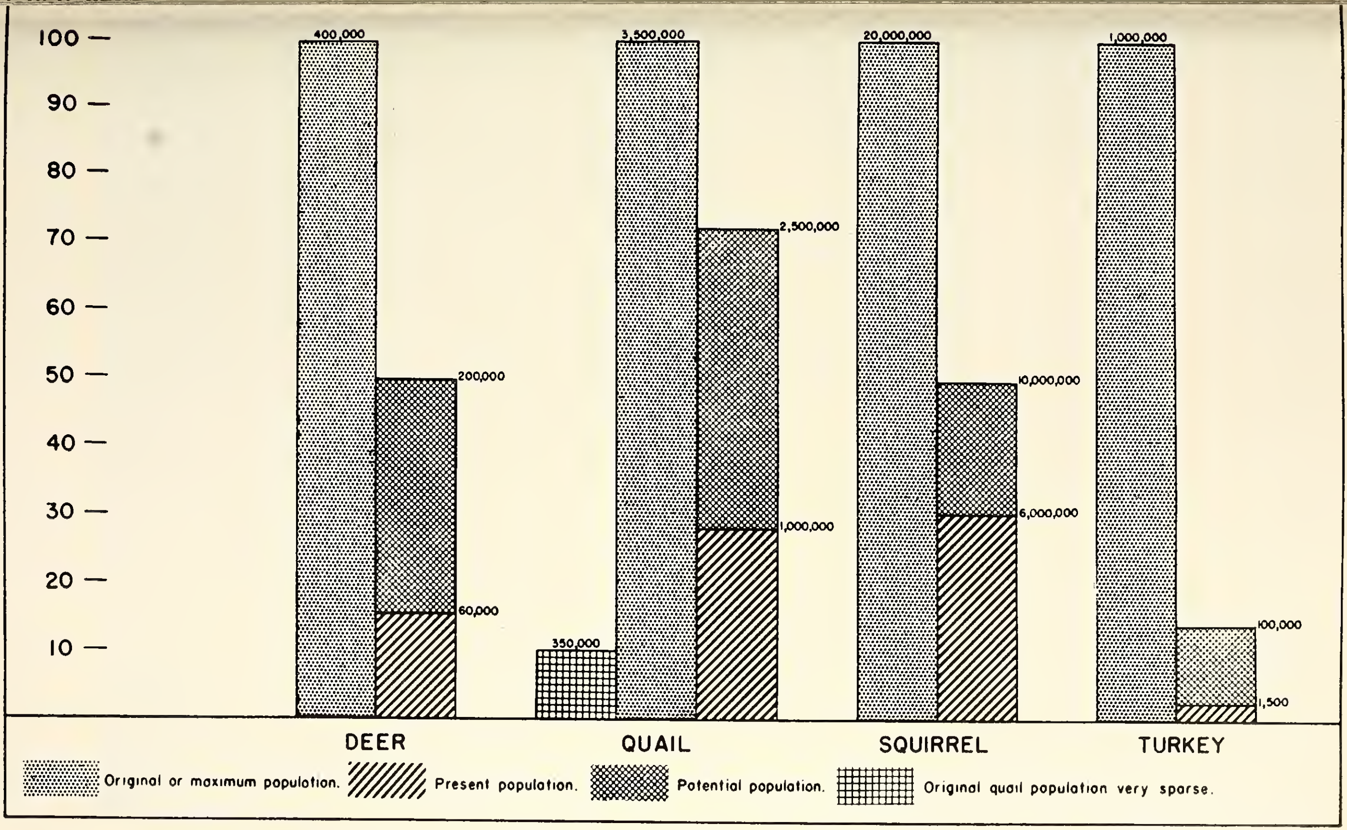
Project 8-R, a study of game conditions and game ranges in Louisiana, was initiated in 1946 and the final report was submitted for approval in July, 1951. This five-year study has resulted in a detailed and careful analysis of game conditions in Louisiana and the factors affecting game conditions. The report, much too long and complex to give in its entirety in this biennial, will be published in book form in the near future. It will consist of some 225 pages, numerous maps, graphs, tables, and photographs. Various phases of the results of this survey have been published from time to time and a considerable portion of the data on game censuses has been summarized in the *Second Biennial Report,* 1946-47, and the *Third Biennial Report,* 1948-49. An attempt to summarize the entire work in this present report would greatly exceed the space and time allotted to this section. In lieu of a general summary, an analysis of the section on Louisiana's game range and the factors affecting them will be discussed. Liberal use is being made of photographs and diagrams to illustrate this important phase of game conditions in Louisiana.

It is the general trend among the conservation-minded laymen as well as some trained observers to place a large portion of the blame for decreasing game populations at the door of the ever-increasing number of hunters. Such a simplified approach does not satisfy all of the factors which go to control game populations. Although hunting pressure may have been a factor in the decline of some game types, not all species are seriously affected by a reasonable annual harvest and there are cases on record where hunting pressure has not entered into the picture at all. One of the prime examples of this latter condition is the case of quail populations in the state of Ohio. The quail in Ohio was considered a songbird and was not hunted for thirty-six years, yet the population declined over the years the same as in adjacent states where the quail was hunted annually. From this it is obvious that hunting pressure played no part in quail conditions there. This same factor can be clearly demonstrated in Louisiana as we examine posted or unhunted lands and find game populations as low or lower than on many of the heavily hunted areas. With this fact so clear, what then is the cause of declining game populations? The complete answer to this important question is perhaps not fully known to anyone, but many factors which have a bearing on the correct answer to this question are known. Probably the one most important single factor is one that is least well known to the average sportsman, i.e., changes in land utilization. There is little doubt that various changes in land usage—such as changes in farming methods, the harvesting of woodlands, the pollution of streams, the increasing urban and suburban areas, and the general advance of civilization—have done more to harm and reduce game populations than any other single factor.

In Louisiana, for example, there are two very important factors governing the present-day game populations. One is the actual loss of game range which has resulted from timber operations, new types of farming, and the advance of civilization. This loss of range, numbering in the millions of acres, has been



COMPARISON OF ORIGINAL AND PRESENT RANGE OF SOME GAME SPECIES IN LOUISIANA.



COMPARISON OF ORIGINAL, PRESENT, AND POTENTIAL POPULATION OF SOME GAME SPECIES IN LOUISIANA, ASSUMING THE ORIGINAL POPULATION TO HAVE BEEN 100 PER CENT.

one of the primary causes in the decreasing game population in Louisiana. Graph I shows this loss of range in millions of acres from the original virgin state before 1700 to that available at present. It is obvious from these data that even if the existing range is producing as well as it did in former years, we would still have less than half of the original game population (Graph II). The second important factor controlling game populations is the producing ability of the presently existing range. This factor, normally termed "carrying capacity," is the one which for the most part governs the actual amount of game on existing ranges and is the one with which the game technician is able to work. Concerning this latter factor, even in cases where changes in land use have not completely destroyed the range, they have often resulted in a great reduction in carrying capacity, which in turn caused a drop in game population. This has been particularly noticeable in areas where clean farming and cattle grazing have all but eliminated native foods and protective cover.

The following series of photographs and charts are arranged to depict some of the more common types of game ranges in Louisiana and the effect that land use has had upon them. For the sake of clearness, the forest game range used by deer, squirrel, and turkey, will be discussed separately from farm game range.

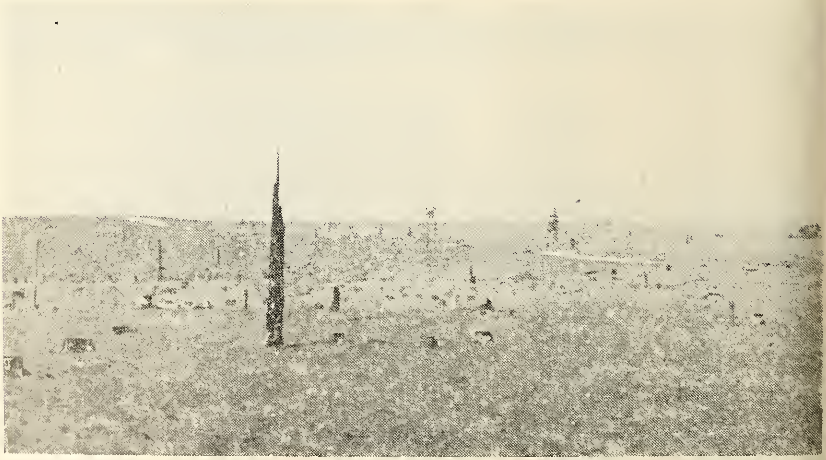


FIGURE 1—This was once a pine forest similar to that shown in Figures 2 and 3. It is obvious why game of all types disappeared from here. Several million acres of once productive game range was lost in this manner. **(Photo, courtesy of Louisiana Forestry Commission.)**

All forest game in Louisiana suffered greatly from a decrease in range after 1900. From the turn of the century until the midtwenties, millions of acres of timber felt the ax, and deer, turkey, and squirrel range was reduced accordingly. Graph I

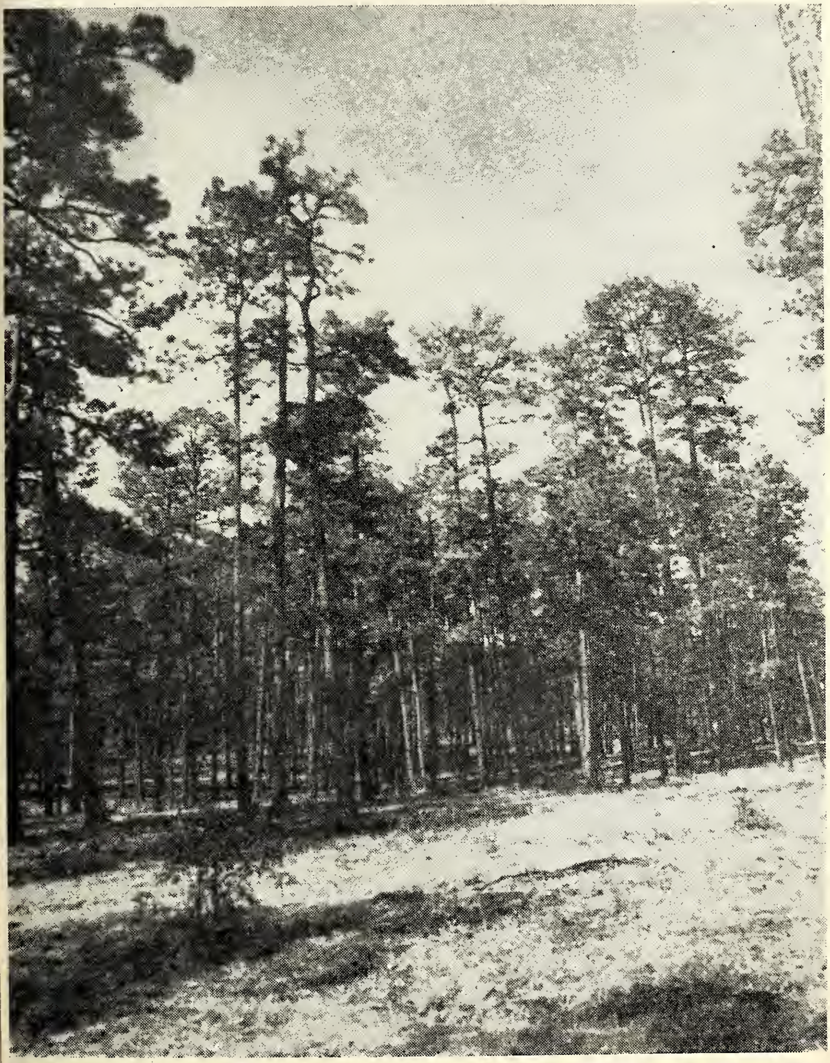


FIGURE 2—Virgin pine such as this once covered much now cutover area shown in Figure 1. Turkey, deer, and quail were prevalent on such range.

FIGURES 3 & 4—These are second-growth pine-hardwood areas. Although they now afford good range for deer and turkey, they are in general devoid of breeding stock. The reason for this is that the severeness of cutting and frequent fires thereafter made such areas unsuitable for game for many years after cutting. Stocking and good protection will result in a rapid expansion of herd in such areas. **(Photos courtesy of Louisiana Forestry Commission.)**

indicates a loss of 16,000,000 acres of deer range, 12,000,000 acres of squirrel range, and 14,000,000 acres of turkey range between 1700 and 1950. Most of this occurred between 1900 and 1930 when the main timber harvest occurred. Over 2,500,000 acres of pure pine land were clean cut and another 5,000,000 acre of pine, pine-hardwoods, and bottomland hardwoods were so cut over and subject to uncontrolled fires that as forest game range they became of no value. Phonographs 1-5 tell a picture story of why forest game disappeared in many areas.

The salvation of the deer and squirrel in Louisiana during this period was the more inaccessible swamps in which many types of unmerchantable scrub timber and plants furnished food and offered a haven for the few remaining deer. See photographs (Figures 6, 7, and 8).

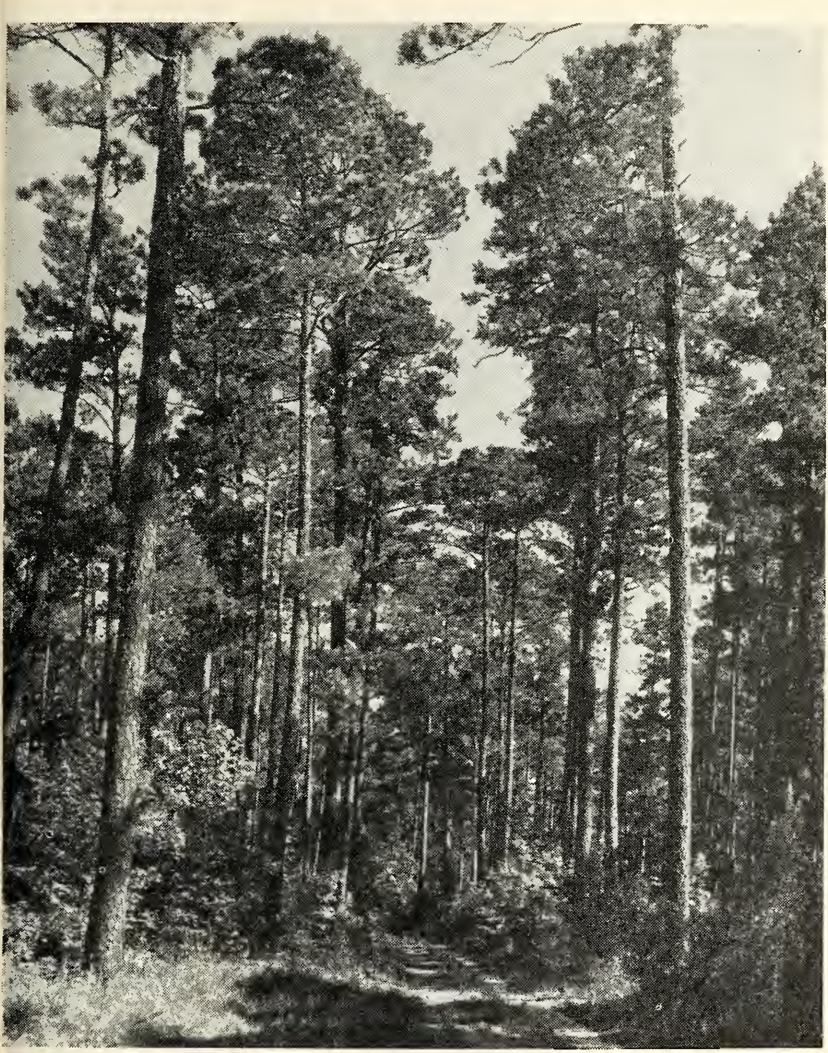


FIGURE 4—As referred to in Figure 3.

The deer population today is in good condition because of two main factors: (1) the fact that cutover bottomland and swamp areas as soon as restored by a second growth condition proved to be a better type of deer range than the original range, and (2) refuges set up in strategic areas as early as 1920 offered

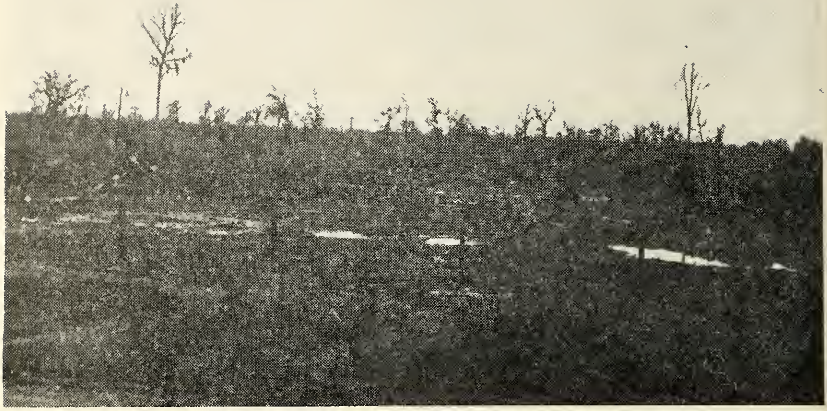


FIGURE 5—Many thousands of acres of bottomland types of forest range was cut and cleared which further reduced the forest game range in the state.

a place of safety to the small herd until ranges were restored by second growth and the herd sizes increased to shootable proportions. (See Figure 9.)

Turkey have suffered more than deer and squirrel because this species requires a more mature stand of timber and a wide variety of food. It is only now that a few pine and hardwood areas are reaching a state of maturity since the original cutting that they can support turkey successfully. In many areas the understory is still too thick and the trees not mature enough to constitute turkey range. (See Figure 9.)

In final analysis, although our forest game has suffered much at the hands of man, conditions are getting better and will continue to do so in years to come. Artificial and natural reforestation, rapidly maturing forest areas, sound forestry management and rotational cutting—all point to a great future for forest game types such as deer, squirrel, and turkey in Louisiana. This will particularly be true with a continuance of the refuge system, good game management, and an intelligent harvest of surplus populations.

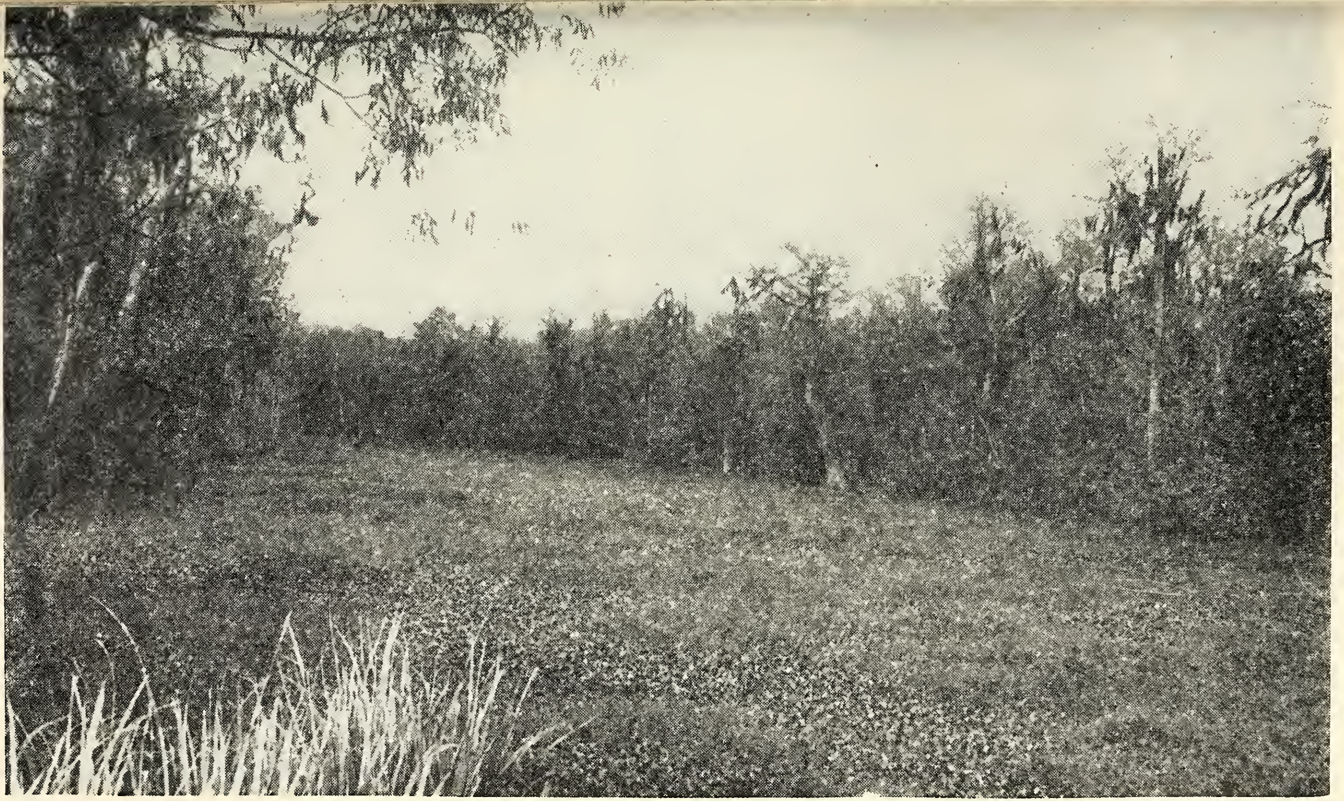


FIGURE 6—Swamps such as this proved to be a protective and saving factor to the few remaining deer that survived he harvest of the bulk of the state's timber between 1900 and 1930

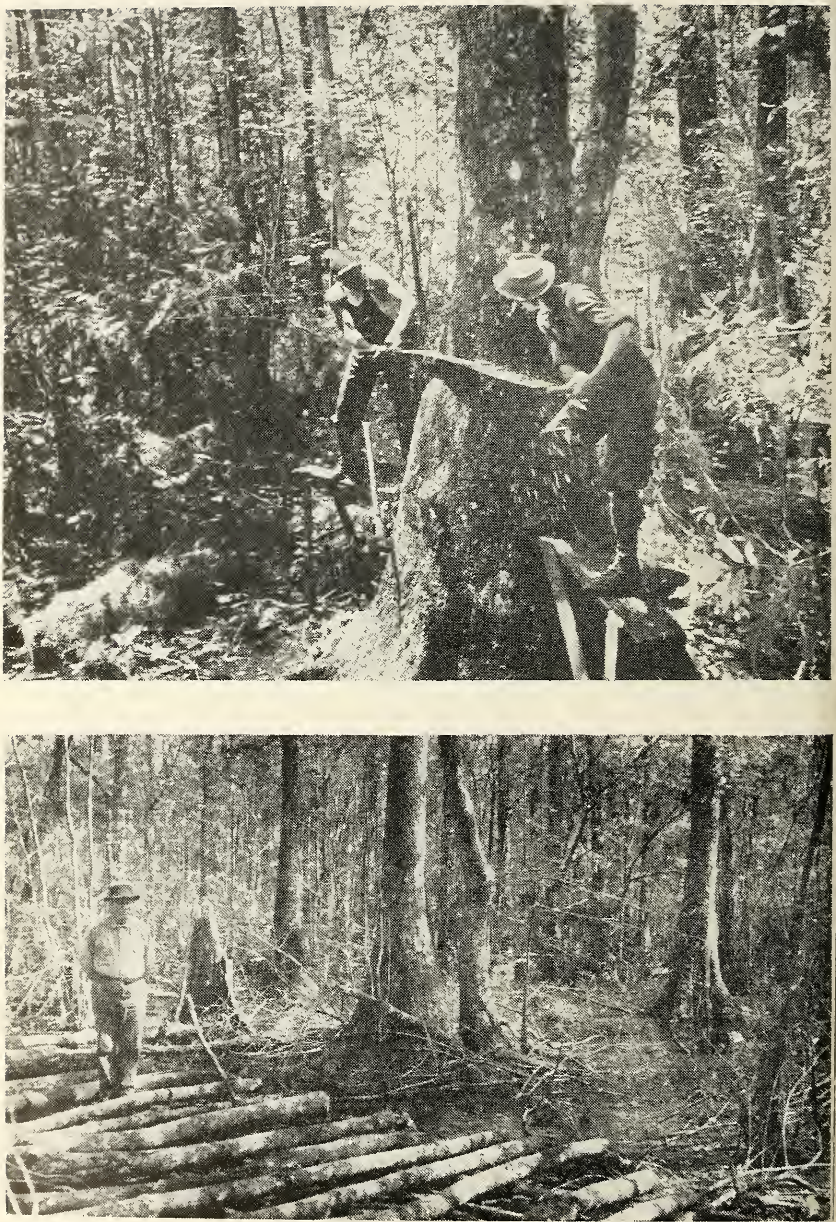


FIGURE 7 & 8—Although many of the large trees were taken from the swamp areas, the dense tangle of the smaller unmerchantable species, offered food and shelter to the forest game, particulary deer. **(Photo courtesy of Louisiana Forestry Commission.)**

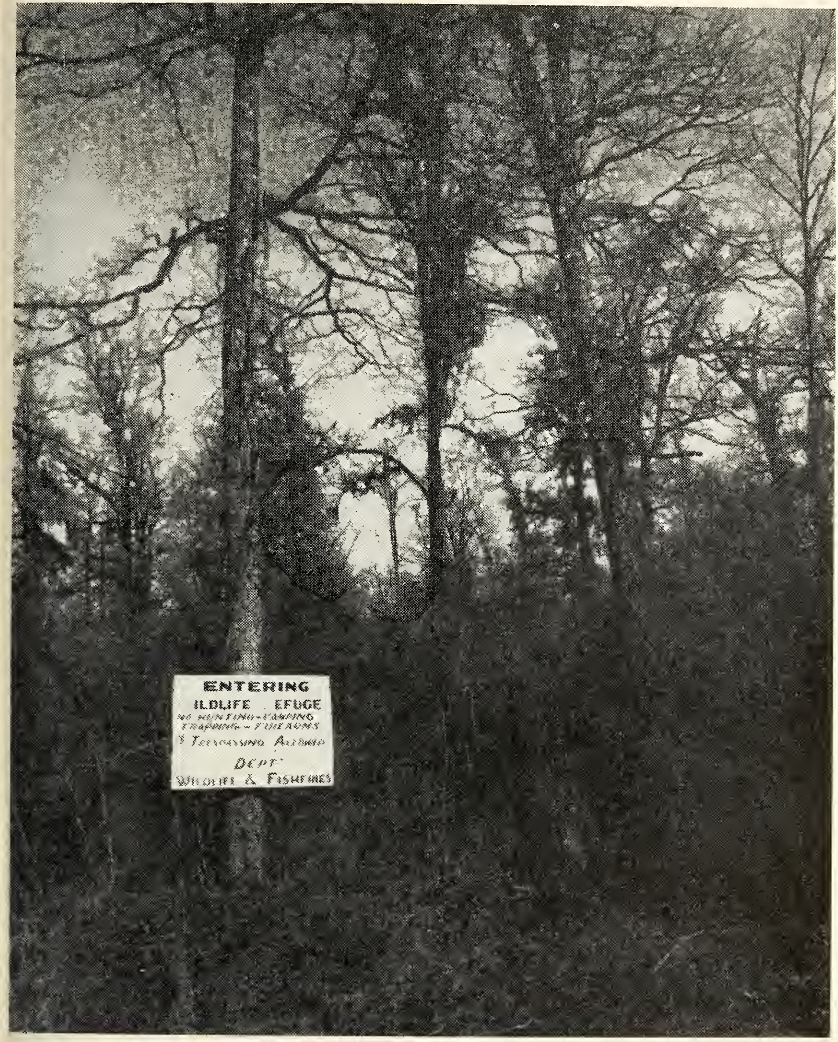
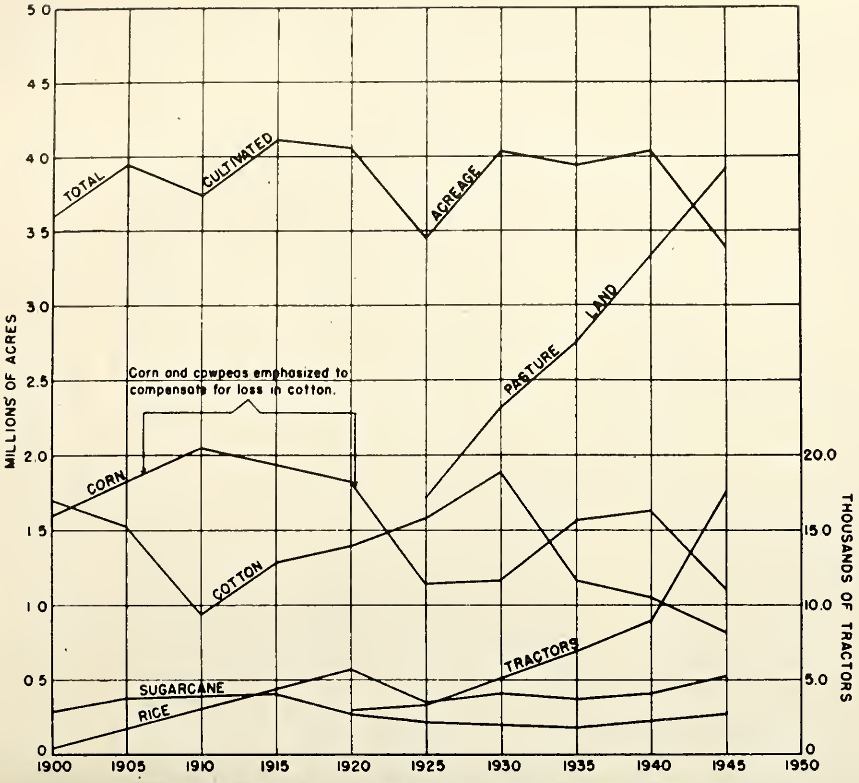


FIGURE 9—Two important factors in maintaining the deer herd in the state durng the period of poor range conditions after cutting were the establishment of refuges and the rapid development of a thick tangle of understory plants in cutover bottomland areas. This was not suitable for turkey, however.

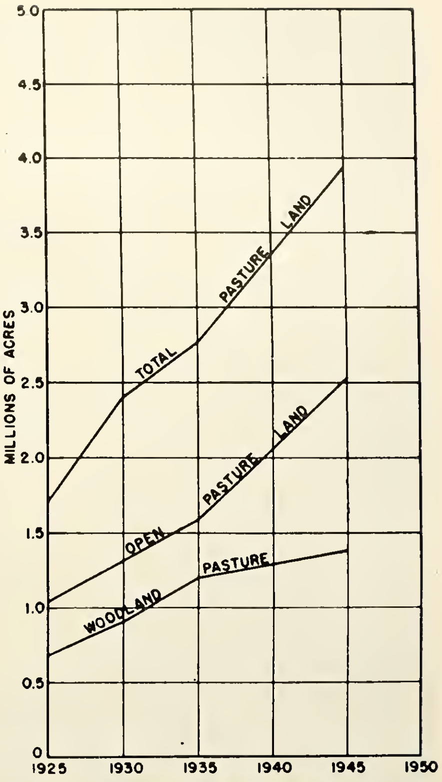
Farm Game

The farm game conditions in Louisiana are not nearly so prosperous or bright as those for forest game. Quail, dove, and rabbit are less numerous than in former years and unless drastic changes occur in land usage there is little likelihood that we



Corn and cowpeas emphasized to compensate for loss in cotton.

CHANGES IN ACREAGE OF CULTIVATED LANDS AND PRIMARY CROPS, 1900-45.
CHANGES IN FARM MECHANIZATION AND PASTURE LAND, 1925-45.

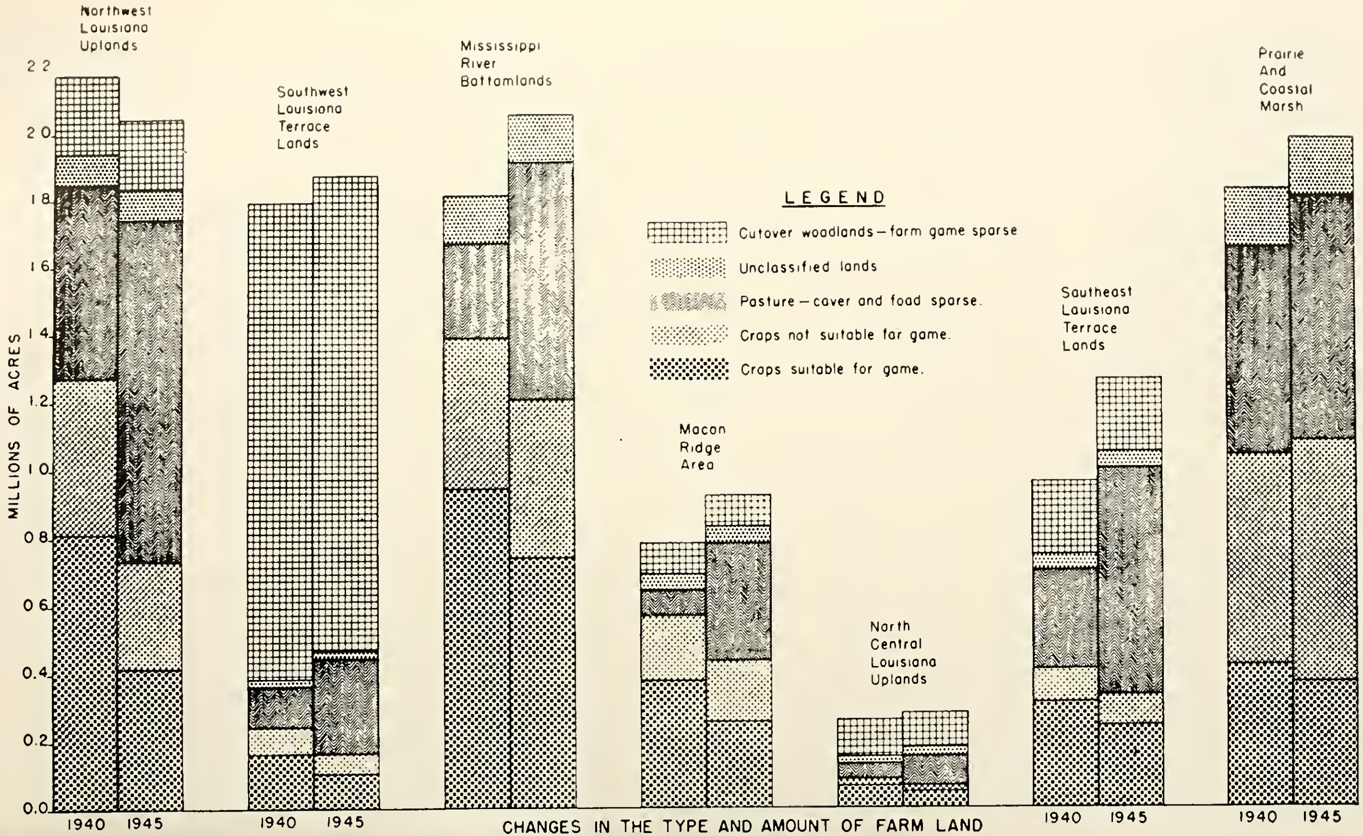


CHANGES IN PASTURE LAND.

may expect startling increases in the future. Such a statement is not meant to convey the idea that nothing is being done to better farm game. Actually great strides in the management of farm game have occurred in recent years but the loss in game from changes in land use practices more than offsets the gain derived from the application of good game management practices. It is the purpose of this discussion to explain by chart, map, and photograph just how drastic these farmland usage changes have been in recent years.

An examination of agricultural census figures for the past forty-five years shows some interesting factors, the important ones of which are depicted in Graph III. One fact that stands out is that the total cultivated farmland has been relatively stable, varying from 3.5 to 4.0 million acres annually. This surprising fact indicates that the farm game range has not increased or decreased markedly during the forty-five year period and it has certainly not decreased to the extent that farm game populations have. The reason for this peculiar fact is that the producing ability or "carrying capacity" of the range has markedly changed and has become less because of changes in the use of the lands. The changes are clearly illustrated in other parts of Graph III. For example, from 1900-1920, corn and cow peas were planted to abundance in order to compensate for cotton acreages lost to the boll weevil. This large acreage of grain cultivated in a semicrude way and left to be hogged off in many instances, formed an ideal farm game range. At that time quail and dove populations were at an all-time maximum. After 1920, corn acreage dropped, clean farming came into being, and the day of poor producing farm game range was born. In this period new methods of farming and increased mechanization on farms has made great strides. Graph III shows a great increase in tractors on farms and a tremendous increase in the pasture land in the state.

These two factors, plus new methods of crop rotation, the practice of fall plowing and the planting of winter cover crops, has greatly changed the productivity of the farm game ranges in the state. Furthermore, the changes are becoming more rapid in recent years. Graph IV shows changes in farmland usage in various parts of the state from 1940-1945. It is immediately obvious from this graph that crops suitable for game have been nearly cut in half over this five year period while pasture lands



CHANGES IN THE TYPE AND AMOUNT OF FARM LAND IN THE VARIOUS ECOLOGICAL REGIONS, 1940-45.

and crops unsuitable for game have increased greatly. Unfortunately, preliminary figures on the 1950 census indicated these changes are continuing at a faster rate and, until conditions become stabilized, it will be hard to predict the future of farm game.

The following photographs show more clearly than words just what changes in farming methods have done to farm game. (See Photographs 10 to 19.)

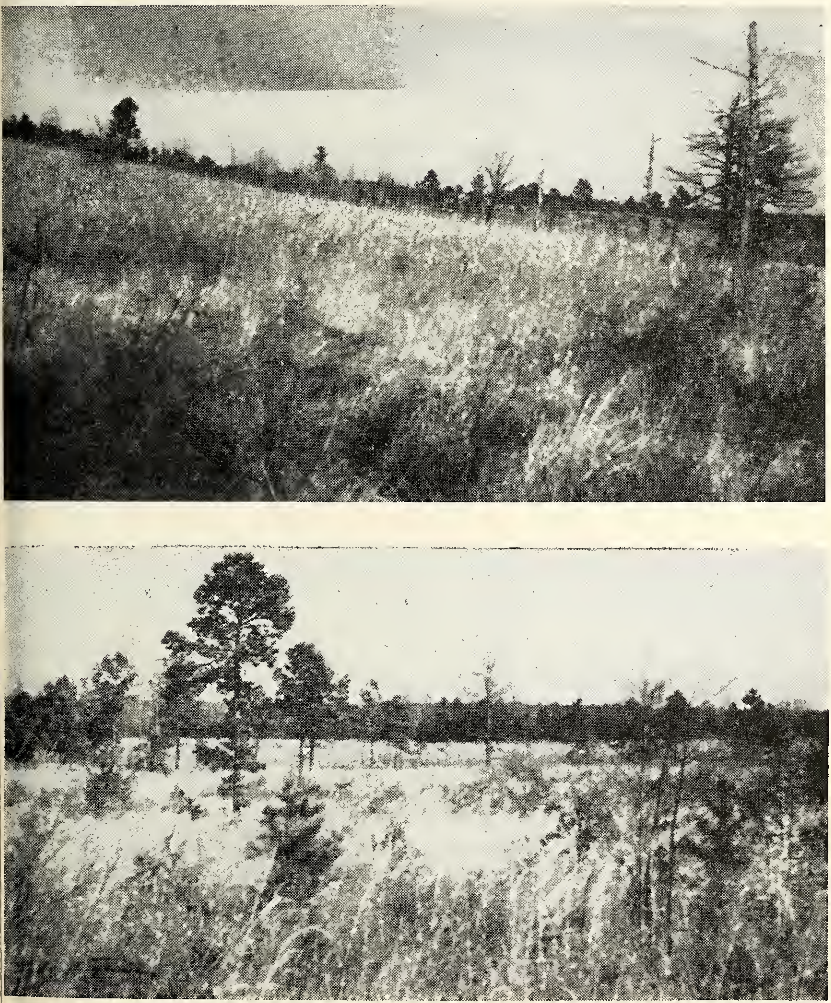
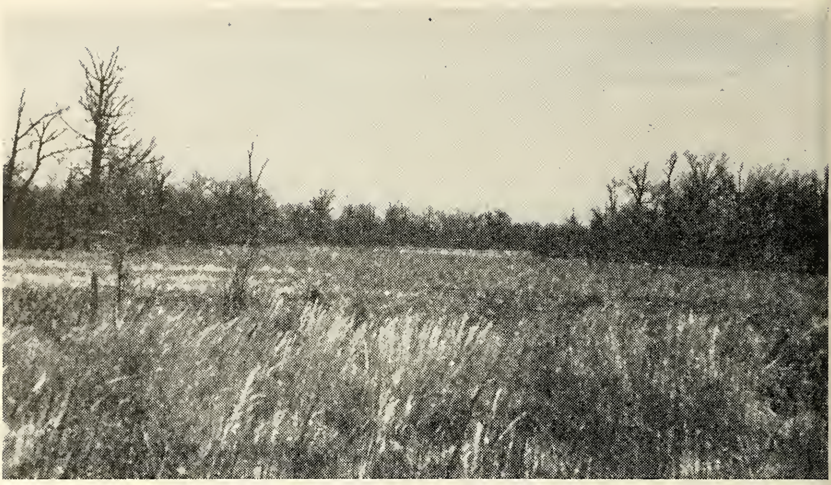


FIGURE 10 & 11—Two views of good farm game range in the pine hill sections of the state. Quail, rabbit, and dove have ample food and protection on such areas.



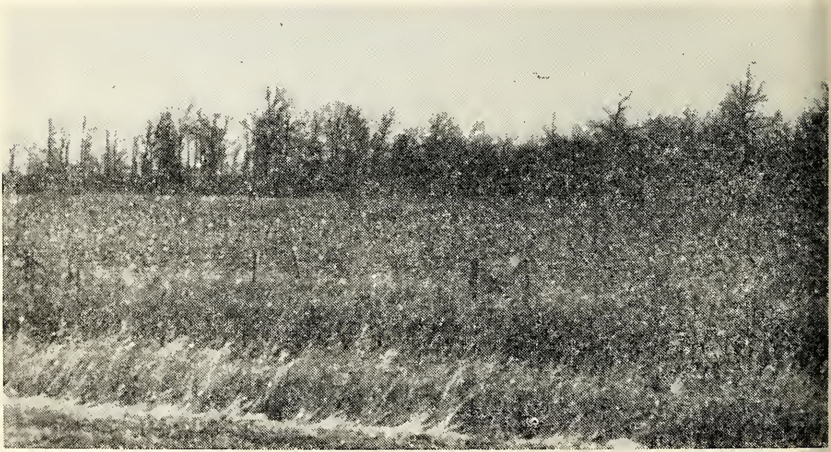
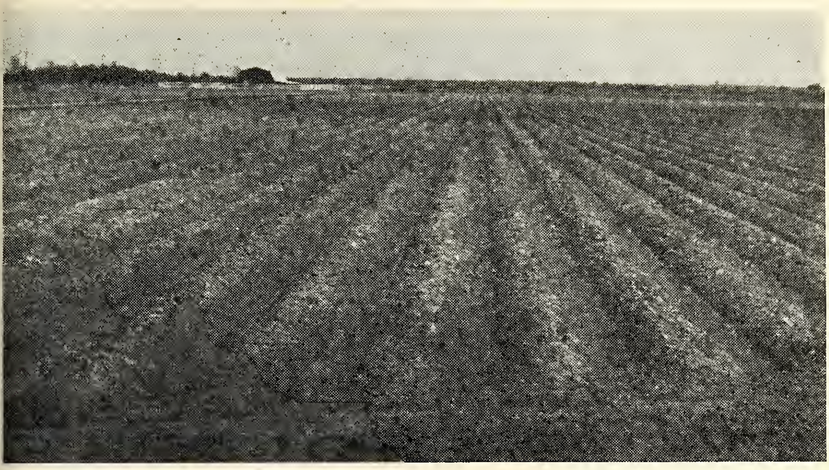


FIGURE 12 & 13—Small, unclean, bottomland grainfields also furnish good farm game range. Unfortunately fewer and fewer fields such as depicted in Figures 10, 11, 12, and 13 are to be found in the state.



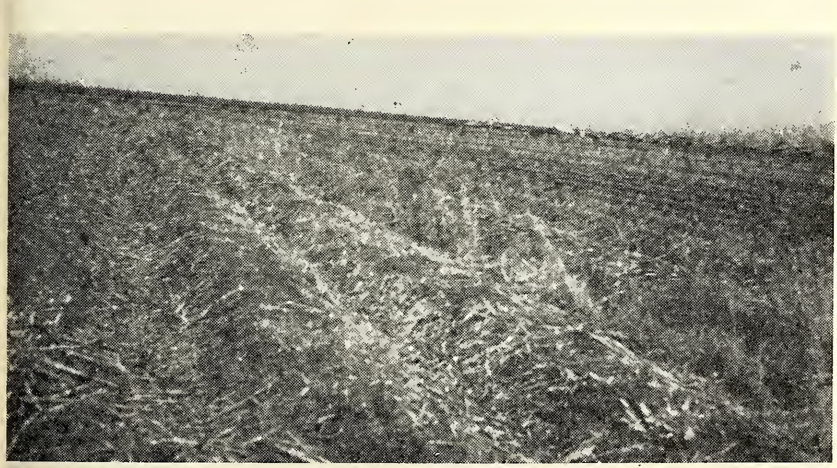


FIGURE 14 & 15—These photographs taken during the mid-winter illustrate the effect of modern farming methods on game. Such clean cotton and sugar cane fields are supporting no game at the height of the hunting season. This condition, occurring over months which are critical in the life cycle of farm game, has eliminated many such areas as game range.

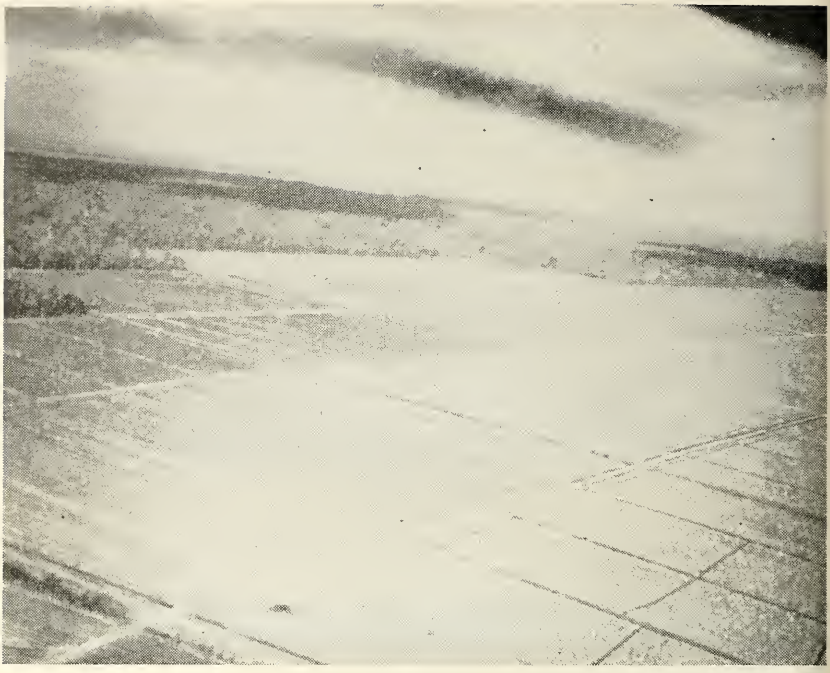


FIGURE 16—This air photograph of a clean hedgerowless plantation indicates clearly what has happened to the farm game ranges in many bottomland areas. Food and cover are practically nonexistent, and quail, dove, and rabbit cannot live in such an area.

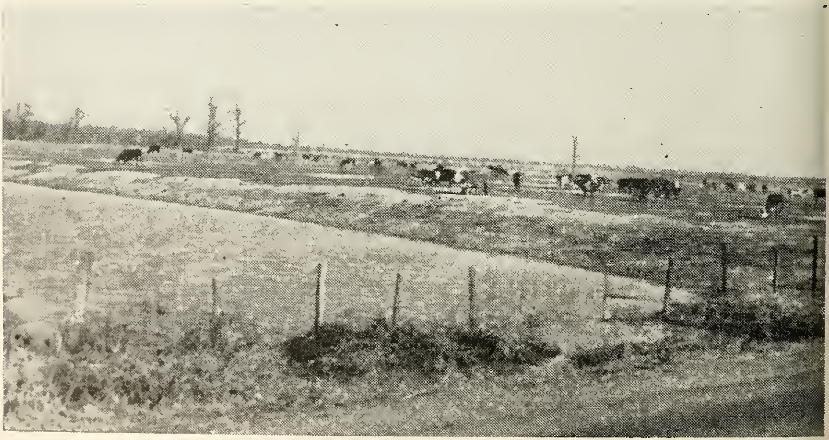


FIGURE 17 & 18—The great increase in heavily grazed pasture lands such as these has eliminated hundreds of thousands of acres of quail and rabbit range. Such clean areas are virtually devoid of all game requiring cover and plant foods.

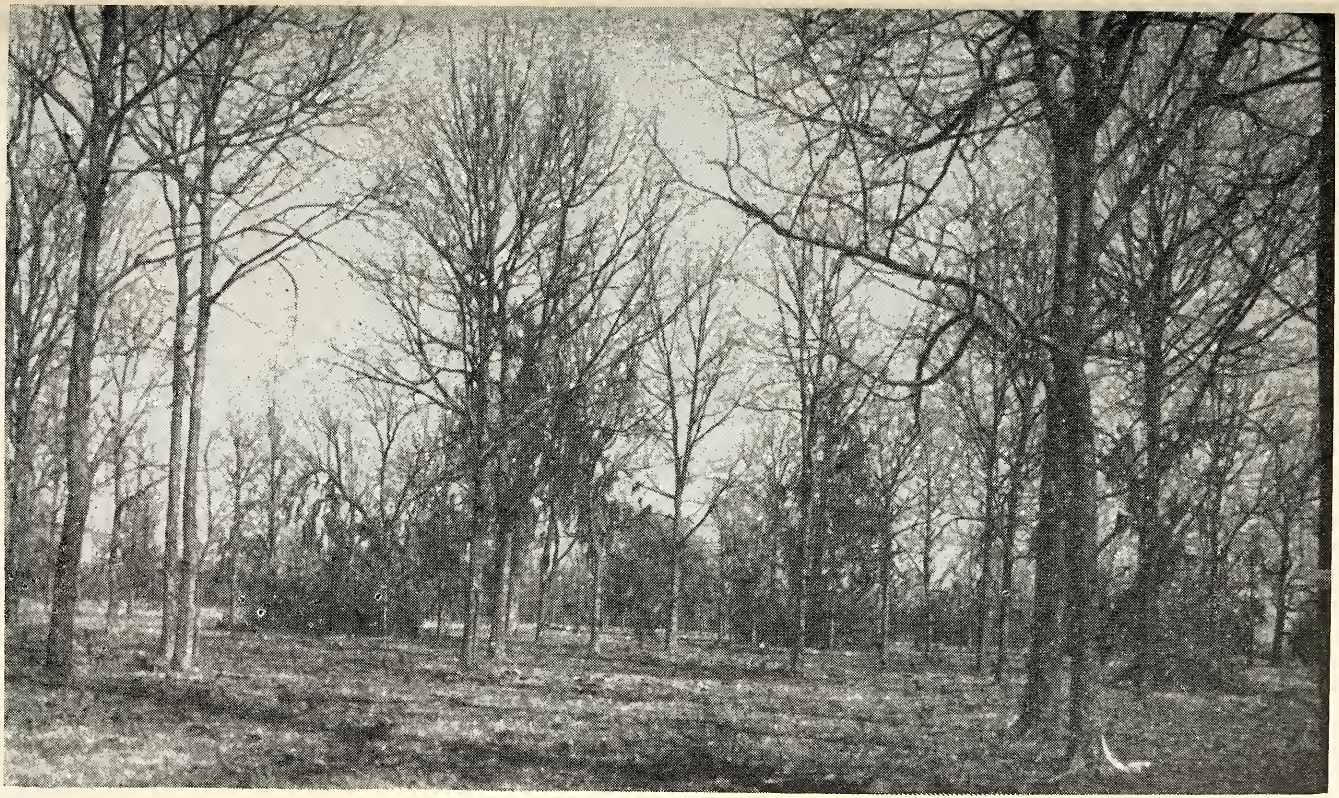


FIGURE 19—Pastured woodlands when heavily grazed have no **under-story** and are virtually deserted by game.

Referred to on previous page.

In conclusion, it should be clear that changes in game ranges and the productivity of game ranges in the state have had a great deal to do with controlling game populations. At present, the future of forest game looks good and conditions are rapidly getting better. On the other hand, the future of farm game types is not clear and will not be clear until farm practices become more stabilized. Once this occurs better management of farm game will occur.

PROJECT 15-R, MOURNING DOVE STUDY

Introduction

The Louisiana mourning dove study was initiated on July 1, 1949, and was originally scheduled to run through June 30, 1952. The primary purpose of this study is to obtain information upon which management recommendations for the mourning dove in Louisiana could be based, and to contribute this information toward the formulation of a management program for the eastern mourning dove throughout the southeastern region of the United States.

Original work plans called for the determination of migration routes and local movements and shiftings of the dove population through an intensive state-wide trapping and banding program. Population trends and fluctuations were to be determined by road counts, observations of trained personnel and other methods. By intensive studies of breeding doves, trends in annual production were to be determined. An analysis of the effects of hunting pressure on the dove population was to be undertaken by checking hunters' bags in the field during open seasons. Necessarily during the course of the work, some of the original procedures have been discarded and others substituted for them. Discussion to follow will be limited primarily to those procedures which have become standardized in attempting to solve the above problems.

Movements and Migrations

TRAPPING AND BANDING—Although the original work plan called for setting up a minimum of twenty trapping stations throughout the state, it was soon evident that this number would have to be modified according to the abundance of doves and the number of reliable trapping station operators that could be located where the doves were. Accordingly, the number of trapping stations in operation at any one time during this period has varied from eight to twenty-six. Figure I gives the location of trapping stations currently in operation as well as the location of former trapping stations.

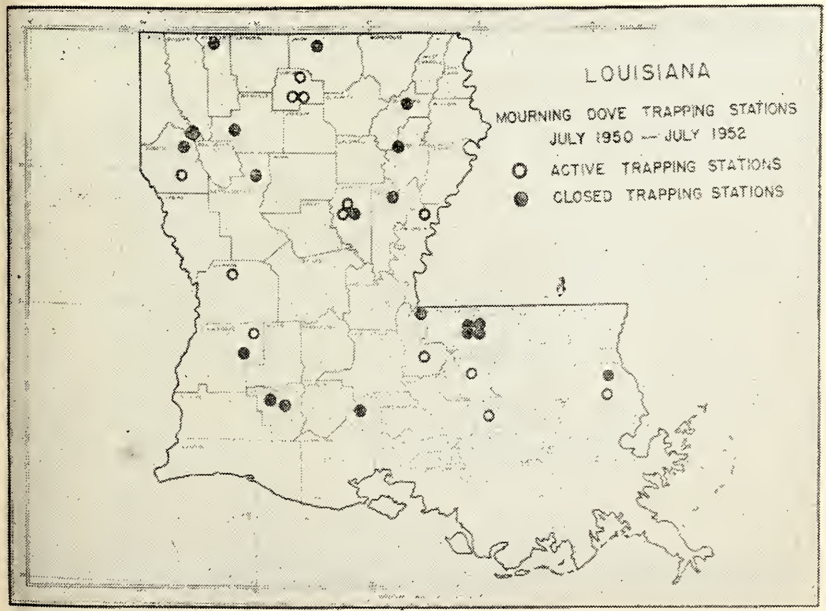

LOUISIANA
MOURNING DOVE TRAPPING STATIONS
JULY 1950 — JULY 1952
○ ACTIVE TRAPPING STATIONS
● CLOSED TRAPPING STATIONS

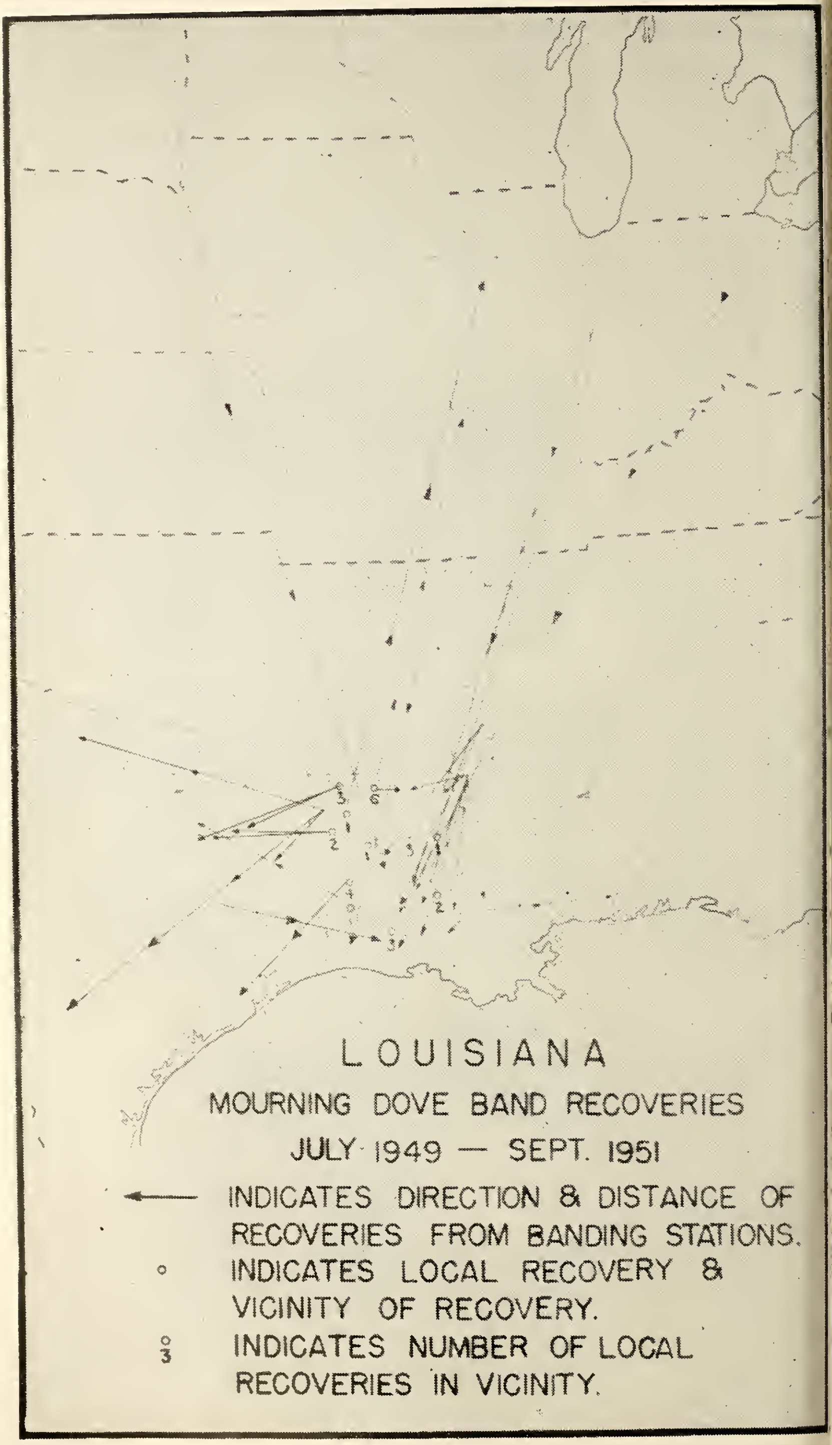
TABLE I—RETRAP DATA—COMPARISON BETWEEN THE NUMBER OF NEW DOVES TRAPPED AND THE NUMBER RETRAPPED EACH MONTH

(July 1949—December 1951)

Total Number New Birds Trapped	Month Banded	1949						1950												1951											
		July	August	September	October	November	December	January	February	March	April	May	June	July	August	September	October	November	December	January	February	March	April	May	June	July	August	September	October	November	December
	1949																														
8	July	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	August	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	September	...	...	...	3	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	October	...	...	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
105	November	...	...	...	...	23	68	26	5	16	10	12	11	1	...	...	1	...	...	1	...	...	...	...	...	...	...	...	...	...	...
115	December	...	...	...	...	...	40	31	16	15	13	5	3	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...
	1950																														
82	January	...	...	...	...	...	...	17	29	11	7	1	...	1	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...
140	February	...	...	...	...	...	...	...	33	43	2	1	2	...	...	...	1	...	...	...	1	...	...	...	...	...	...	...	...	...	...
238	March	...	...	...	...	...	...	...	...	278	98	18	3	...	3	2	...	1	...	1	...	...	...	...	...	...	...	...	...	...	...
293	April	...	...	...	...	...	...	...	...	...	133	103	51	4	...	3	1	...	...	...	1	...	1	8	...	...	...	...	...	...	...
184	May	...	...	...	...	...	...	...	...	...	...	49	43	2	...	2	1	...	...	...	...	...	3	11	...	...	...	...	...	...	...
217	June	...	...	...	...	...	...	...	...	...	...	...	28	9	3	...	1	...	...	...	...	...	1	10	14	5	3	...	...	...	...
109	July	...	...	...	...	...	...	...	...	...	...	...	...	9	6	5	...	...	1	...	...	...	...	8	13	7	3	...	...	...	...
97	August	...	...	...	...	...	...	...	...	...	...	...	...	...	5	6	...	...	...	3	...	...	3	5	10	3	...	...	...	...	...
78	September	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4	3	...	...	...	...	...	2	5	4	2	...	...	...	...	...
83	October	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	5	7	1	1	...	...	2	2	1	2	...	...	...	...	...
132	November	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	23	9	...	...	...	6	2	...	...	...	...	...	...	...
56	December	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...

TABLE I—RETRAP DATA—COMPARISON BETWEEN THE NUMBER OF NEW DOVES TRAPPED AND THE NUMBER RETRAPPED EACH MONTH (Continued)

Total Number New Birds Trapped	Month Banded	1949						1950												1951											
		July	August	September	October	November	December	January	February	March	April	May	June	July	August	September	October	November	December	January	February	March	April	May	June	July	August	September	October	November	December
	1951																														
66	January	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	3	3	6	1	2	...	...	...	...	...	...
63	February	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	9	5	...	2	...	1	...	...	...	...
61	March	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	15	5	...	...	1	...	...	...	...
163	April	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	44	39	26	1	1	2	...	...	...
236	May	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	62	93	11	9	7	...	...	...
164	June	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	60	24	5	...	...	...	...
210	July	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	37	10	11	...	...	...
428	August	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	7	6	11	...		
96	September	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	9	...	...	2
16	October	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	November	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...
29	December	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	7	...



LOUISIANA

MOURNING DOVE BAND RECOVERIES

JULY 1949 — SEPT. 1951

← INDICATES DIRECTION & DISTANCE OF RECOVERIES FROM BANDING STATIONS.
○ INDICATES LOCAL RECOVERY & VICINITY OF RECOVERY.
$\overset{\circ}{3}$ INDICATES NUMBER OF LOCAL RECOVERIES IN VICINITY.

Prior to the period covered by this report, 298 doves had been trapped and banded and 139 repeat captures had been made. At the present time, 3,571 doves have been trapped and banded and at least 2,741* repeat captures have been made.

Table I shows the number of repeat captures made each month in relation to the total number of new birds banded each month since the project was initated. These data are valuable in that they demonstrate the period of the year during which the dove population is most stable. This period can be directly interpreted as the major breeding period for the species, which, in this case, is the months of April, May, June, and July.

Up until the opening of the 1951 hunting season, there were forty-two local and foreign band recoveries reported. There have been an additional fourteen recoveries of bands in Louisiana from doves banded in other states.

By plotting the band recoveries on a map of the United States, Figure II, showing direction of movement from banding site to recovery site, it can be seen that the major portion of our wintering dove population originates in the midwest and the upper Mississippi River Valley.

Reference to Table II, which shows all band recoveries reported thus far, will show evidence that our so-called resident or breeding population leaves Louisiana in September each year and goes into Texas, and possibly winters in that state and further south. There is some indication of an eastward movement of a segment of the population along the Gulf Coast in late fall.

To supply additional information on local movements and shiftings within the population, a method of color marking doves was developed in the summer of 1950. This system was put into effect in the summer of 1951 and although approximately 400 doves were marked only two sight records were reported. This part of the work will be continued during the summer of 1952.

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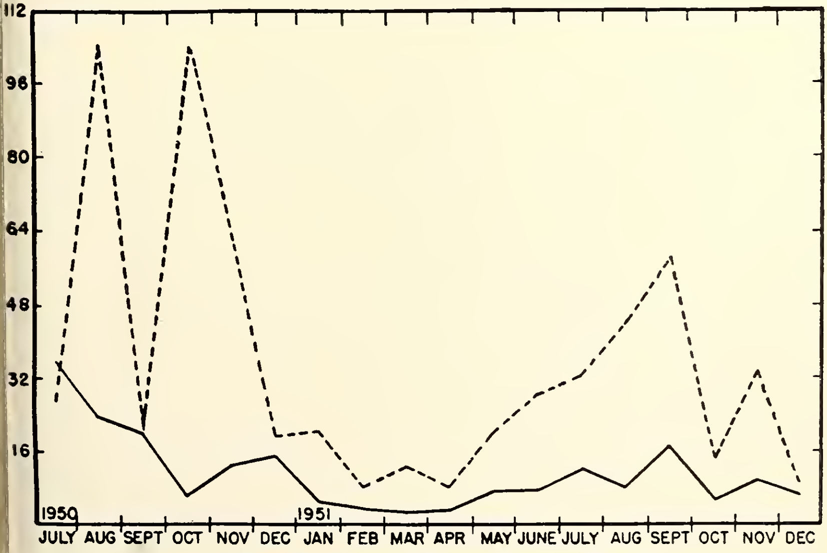
* Some trapping station operators have not kept records of repeat captures.

TABLE II—BAND RECOVERIES

Band No.	Where Banded	Date	How Recovered	Where Recovered	Date
49-330092	Lincoln Ph.	9-23-49	Shot	Local	5-17-59
49-330090	Lincoln Ph.	9-22-49	Found dead	Local	1-19-50
49-330147	Lincoln Ph.	12-23-49	Shot	Local	12(1-30)50
49-330159	Lincoln Ph.	1- 2-50	Shot	Ouachita Ph.	12-12-50
49-330328	East Baton Rouge	7-27-49	Shot	Plaquemines Ph.	11-18-49
49-330359	Caddo Ph.	8- 5-51	Shot	Young Co., Texas	9- 2-51
49-330476	Jeff. Davis Ph.	4-28-50	Shot	Local	12-29-50
49-330528	Vernon Ph.	12- 4-49	Found dead	Local	12-16-49
49-330558	Vernon Ph.	3- 8-50	Found dead	Local	5- 2-50
49-330568	Vernon Ph.	3-24 50	Found dead	Local	5- 5-50
49-330716	Natchitoches Ph.	11-19-49	Shot	Local	12-16-50
49-330951	Lincoln Ph.	2- 4-50	Found frozen	Local	1-29-51
49-330982	Lincoln Ph.	4- 1-50	Killed by dog in trap	Local	5- 7-50
49-330989	Lincoln Ph.	4-11-50	Shot	St. Louis Co., Mo.	9- 1-50
49-357020	Caddo Ph.	8- 5-51	Shot	Bexar Co., Texas	9- 6-51
49-357219	Beauregard Ph.	2-27-50	Killed by cat in trap	Local	5- 8-50
49-357236	Jeff. Davis Ph.	11-22-49	Shot	Local	12-26-50
49-357271	Jeff. Davis Ph.	12-16-49	Found dead	Local	2-26-50
49-357357	DeSoto Ph.	3-24-50	Dead in trap	Local	4- 3-50
49-357620	Bienville Ph.	4- 5-50	Shot	Peoria Co., Ill.	9- 2-51
49-357621	Bienville Ph.	1-24-51	Found frozen	Local	2- 1-51
49-357931	Webster Ph.	5-18-51	Shot	Limestone Co., Texas	10- 3-51
49-358003	Webster Ph.	1-27-50	Shot	Local	3- 7-50
49-358041	Webster Ph.	3-13-50	Found frozen	Local	1-29-51— 2- 4-51
49-358049	Webster Ph.	4-14-50	Found frozen	Local	1-29-51— 2- 4-51
49-358054	Webster Ph.	4-20-50	Found frozen	Freestone Co., Texas	2- 2-51
49-358331	Vernon Ph.	4-16-50	Found frozen	Brazoria Co., Texas	Feb. '51
49-358342	Vernon Ph.	4-23-50	Found dead	Local	6-19-50
49-358727	LaSalle Ph.	5-29-50	Shot	Catahoula Ph.	12-21-50
49-358789	LaSalle Ph.	8-20-51	Shot	Local	Fall '50
49-358793	LaSalle Ph.	9- 2-50	Shot	Local	Fall '50
49-358819	Concordia Ph.	6-10-50	Shot	Local	12-27-50
49-358910	DeSoto Ph.	6-14-50	Shot	McGregor, Texas	9- 6-50
49-358914	DeSoto Ph.	6-14-50	Shot	Local	12-10-50
49-358962	DeSoto Ph.	7- 1-50	Shot	Henderson Co., Texas	9- 9-50
513-24125	W. Feliciana Ph.	12- 4-51	Shot	Local	12-27-50
513-24127	W. Feliciana Ph.	10-21-50	Shot	Local	12-27-50
512-24209	Lincoln Ph.	2- 8-51	Killed by hawk in trap	Local;	4-22-51
[illegible]	[illegible]	[illegible]	[illegible]	[illegible] Co., Texas	12(1-19)51

ROAD COUNTS—At the beginning of this study, two types of road counts were being used in an effort to determine monthly and yearly trends in the dove population. These counts were the random road count in which a record of all mileage and the number of doves seen was kept while traveling about the state, without regard to time of day, speed of travel or locality, and the controlled road count in which a twenty-five mile route was selected and run weekly at the same speed, at the same time of day, and all doves counted. Both counts were tabulated on the number of doves per 100 miles basis. It has been determined that both type counts yield essentially the same information regarding trends in the dove population, Figure III, and for this reason the more time consuming and expensive controlled road counts have been discontinued.

The difference in indicated trends in the population for July, August, September, and October, 1950, shown by the two types of road counts, can possibly be attributed to inadequate data.



TRENDS IN THE DOVE POPULATION
AS SHOWN BY RANDOM & CONTROLLED ROAD COUNTS
——RANDOM COUNT
----CONTROLLED COUNT
FIGURE 3

TABLE III—RANDOM AND CONTROLLED ROAD COUNTS

(July 1950-December 1951)

	RANDOM ROAD COUNTS				CONTROLLED ROAD COUNTS			
	1950		1951		1950		1951	
Month	Miles	D./100 M.	Miles	D./100 M.	Miles	D./100 M.	Miles	D./100 M.
January	....	....	3812	4.8	....	....	500	21
February	....	....	2268	3.7	....	....	845	8.2
March	....	....	2904	2.2	....	....	870	13.4
April	....	....	7239	2.7	....	....	1100	8.2
May	....	....	9348	7.6	....	....	900	20.5
June	....	....	8589	7.53	....	....	962	27.8
July	1347	35.6	6317	10.9	50	26	1040	33.6
August	3090	23.6	8028	7.8	50	104	1037	44.0
September	1777	20.2	6702	16.8	25	20	584	58.5
October	4962	7.2	7445	4.6	175	103.4	637	14.2
November	8688	12.4	3967	9.7	225	62.2	484	33.0
December	5304	15.1	2434	6.1	175	19.4	375	9.0

A tabulation of random and controlled road count data from July, 1950, through December, 1951, is presented in Table III. Aside from illustrating the seasonal abundance of doves, these illustrations show that there has been a decline in the dove population during the past two years.

WINTER INVENTORY—During early February, 1950, and late January to early February, 1951, an attempt was made to develop a method of determining the annual winter dove population.

In 1950 a combination rural mail carrier road count and biologist road count and plot survey was made. During the week of February 6-10, a number of rural mail carriers throughout the state recorded the number of doves seen along their mail routes each day. At the same time Pittman-Robertson biologists made road counts over twenty-five mile transects and censused a 160 acre plot with each transect. An attempt was made to cover one-tenth of one per cent of the total land area in the state.

When these data were evaluated, it became apparent that the more economical rural mail carrier counts furnished more reliable information than the biologist road count and plot surveys. Therefore the latter were discontinued. The rural mail carrier inventory was again undertaken during the week of January 29 to February 2, 1951, on a much wider scale. During the week of the inventory a severe ice storm covered most of the state and caused temperatures in many localities to drop to an all time low. Ice and snow remained on the ground throughout most of the week and subnormal temperatures prevailed. The total effect of this period of adverse weather on the dove population could not be ascertained, but it is known that many doves died as a direct result. Undoubtedly, the results of the inventory were affected.

Table IV shows rural mail carrier inventory data for 1950-1951. These data indicate a considerable decrease in the dove population from 1950 to 1951.

TABLE IV—RURAL MAIL CARRIER INVENTORY BY ECOLOGICAL TYPE

(1950-1951)

Ecological Type	Number Carriers Reporting		Average Number Doves per 100 Miles	
	1950	1951	1950	1951
Marsh	22	18	7.5	4.7
Prairie	13	27	20.1	34.7
Upper Mississippi flood-plain	17	20	26.3	13.2
Lower Mississippi flood-plain	6	34	6.5	9.8
Florida parishes	14	34	19.3	12.3
Cutover pine	13	16	19.6	14.0
North Louisiana oak-hickory	37	93	11.9	5.7
State	122	242	17.6	12.0

PRODUCTION STUDIES—During the breeding season of 1950 complete data were collected on one hundred forty-five dove nests. Data on thirty-four of these nests were furnished by Mr L. L. Glasgow of the Louisiana State University School of Forestry. Ninety-five of the one hundred forty-five nests were considered to be successful. (A nest in which at least one young was fledged was considered to be successful.) This gives a success ratio of approximately two successful to one unsuccessful. One hundred sixty-nine young were fledged from the ninety-five successful nesting attempt, giving a production ratio of 1.78 young plus successful nesting attempt, and 1.16 young produces per nesting attempt. Nests were found in twenty-one species o trees and shrubs, on stumps, and two nests were observed o the ground.

CALL COUNTS—

After an unsuccessful attempt to determine the breeding dove population by plot censuses during the 1950 breeding season, call-counts were undertaken as a means of determinin trends in the breeding population during 1951. These count involved setting up two routes of twenty miles each in eac ecological zone in the state. Each route was covered once eac month during April, May, June, July, and August. All count were started thirty minutes before local sunrise and at the en of each mile a three-minute stop was made, during which tim all doves cooing and the total number of coos were counted. I addition, all doves seen along the route, both while driving an stopped, were counted and an 80-acre plot census was mad somewhere along one route in each zone during May and July.

TABLE V—DISTRIBUTION OF BREEDING DOVE POPULATION AS SHOWN BY CALL-COUNTS

Month		Prairie	Florida Parishes	Marsh	Cut-over Pine	Lower Miss. River Floodplain	Upper Miss. River Floodplain	North La. Pine-Oak Hickory
April	No. counts	1	2	2	1	2	1	2
	No. doves heard	5	18	2	1	27	11	29
	Total No. coos	34	51	23	5	165	43	124
	Doves seen/m.	.15	.12	.02	.1	.5	.3	.2
May	No. counts	2	2	2	1	2	1	2
	No. doves heard	10	15	5	5	17	18	22
	Total No. coos	66	80	27	20	67	76	72
	Doves seen/m.	.17	.25	.15	.3	.15	1.25	.27
June	No. counts	2	2	2	1	2	2	2
	No. doves heard	2	10	6	2	17	30	27
	Total No. coos	7	44	21	7	91	193	66
	Doves seen/m.	.07	.15	.32	.25	.27	1.2	.52
July	No. counts	2	2	0	1	2	2	2
	No. doves heard	3	7	0	3	8	47	12
	Total No. coos	18	34	0	21	39	244	29
	Doves seen/m.	.1	.22	0	.25	.32	.85	.42
August	No. counts	2	2	2	1	2	2	2
	No. doves heard	4	4	5	3	9	30	2
	Total No. coos	18	21	18	20	32	187	5
	Doves seen/m.	.3	.45	.17	.3	.4	1.37	.72

Although this study was undertaken to provide a means for determining trends in the breeding population as a whole, it also showed the relative abundance of breeding doves in each ecological zone in the state. Table V shows call count data collected during the 1951 breeding season. These data indicate that the upper Mississipp River Valley flood-plain maintained a higher breeding population than any of the other ecological zones with the north Louisiana pine-oak-hickory uplands second, the lower Mississippi River flood-plain third, the Florida parishes fourth, and the remainder of the zones about equal, all maintaining relatively low populations of breeding doves.

It was found that the 80 acre plot censuses yielded no usable information, possibly because of the small number of plots, therefore this part of the study is not being included in future work.

The value of the call-counts will be shown only after several breeding seasons have been covered, showing trends in production from year to year, since it has been demonstrated that these counts will yield a statistically sound measure of trends in the breeding dove population.

Hunting Effects

During both years covered by this report, the dove hunting season has been the month of December. According to information gathered during the course of this study, the dove season in Louisiana has not corresponded to the time when the greatest number of doves are available to the gunner. The December season is apparently satisfactory for the southwestern part of the state, but for the remainder of the state a better season would be either the month of January or a split season having the first fifteen days from September 1-15 and the second fifteen days from January 1-15. Our data have not shown that the early September season would seriously affect breeding birds. The above recommendations for the dove season would provide all persons in the state interested in the sport of dove shooting an equal chance of participating. Available information indicates that a much greater harvest of doves during the early part of the season could be withstood without materially lowering breeding potential for the following year

During the open season on doves in both years covered by this report, project personnel spent most of their time in the field locating hunts and making hunter bag checks; in the 1951 season almost the entire Federal-Aid staff of the Louisiana Department of Wild Life and Fisheries spent the first two days of the open season assisting in this work. Additional assistance was given by Mr. L. L. Glasgow and graduate students in game management from the Louisiana State University School of Forestry. Hunter bag check information obtained during both seasons is presented in Table VI. These data indicate a drop in the dove population from 1950-1951 by the lower number of doves bagged per hunting effort and the number of doves bagged per hour. However, a comparison of the adult-juvenile ratios for the two years will show that a slightly more successful breeding season is indicated for 1951.

Our data show that for every eight doves bagged an additional one is lost through crippling; this ratio was slightly higher in 1951.

Observations of project personnel have revealed that heavy gunning pressure for no more than two successive days will cause almost complete dispersal of flocks of doves from feeding areas regardless of the amount of food available.

Prior to the opening of the dove hunting season in 1950 over one thousand questionnaires relating to dove kill were mailed to Louisiana Wildlife Federation clubs throughout the state and it was requested that the forms be distributed to members who were to fill them out and return them at the end of the season. This was done in an effort to obtain some information relative to total dove kill in the state as well as distribution of dove hunting pressure; however, only one questionnaire was returned.

TABLE VI—POPULATION COMPOSITION AND HUNTER SUCCESS AS SHOWN BY HUNTER BAG CHECKS

(1950-1951 Hunting Seasons)

Number bags checked	143	292
Total No. doves bagged	726	895
Average No. doves per bag	5.07	3.05
Total No. hours hunted	413.25	764.5
Average No. doves per hour	1.7	1.1
Aduts-juvenile ratio	66:34	62:38
Number adults in bag	408	413
Number of juveniles in bag	207	248
Crippling loss		
No. doves	91	155
Per cent total bag	12.5	17.3

NOTE: The differences in the total number of doves bagged and the number of adults and juveniles combined can be accounted for by doves that were plucked when the hunters were contacted, thereby making it impossible to age these doves.

A different type questionnaire is planned for after the 1951 hunting season. This will be a simplified form with only four or five questions on a postcard. The mailing list will be made up from names and addresses on hunting license stubs. A total of 5 per cent of all the hunters holding licenses in each parish will be sent questionnaires.

PROJECT 17-R, MIGRATORY WATERFOWL INVESTIGATION

Introduction

Project 17-R was first initiated on July 1, 1949, with the intention of gathering information on migratory waterfowl and waterfowl areas in Louisiana.

During the first two years, all research was confined to four of the major waterfowl areas in north Louisiana. On July 1, 1951, the work plan was expanded to include the coastal marsh area and an assistant project leader was added to carry out the additional work.

The principal objectives of the project are threefold: to census waterfowl throughout the fall and winter in order to determine population peaks and gather other data that may be useful in setting the hunting season; to conduct a hunting pressure study in order to gather information about the kill of ducks and geese over the state; to carry out a habitat survey of existing and prospective waterfowl areas in an effort to gather information that may be useful in making the state more attractive to the wintering flocks of waterfowl. Other incidental activities carried out during the past two years have been to study the usage of wood duck nesting boxes, to determine the possible benefits to waterfowl of brush control on Catahoula Lake, to determine the food habits of ducks through stomach analysis, and to determine the practicability of artificial food planting on the Mississippi River.

General State-Wide Hunting Conditions, Habitat Surveys, and Waterfowl Management in North Louisiana

One of the principal facts revealed in working with waterfowl and duck hunters over the state is that while Louisiana winters or serves as a transient area for millions of ducks and geese each winter, the average person does not have a place to hunt. Southwest Louisiana, the major waterfowl region in the state, contains about 2,000 square miles of marsh and yet the average hunter in Lake Charles or Lafayette cannot find a place to hunt without paying $5 to $20 per day, depending upon the quality of the area. Most of southwest Louisiana is tied up in State refuges, Federal refuges, or posted corporation ownerships. The remainder of the region is privately owned or leased to hunting clubs and these areas are also posted.

In southeast Louisiana, hunting opportunities are slightly better, but the situation here will soon be the same as in southwest Louisiana. The better hunting areas are principally posted to the average hunter and the remainder of the marsh in this section of the state is being rapidly closed to public hunting.

Hunting opportunities in north Louisiana are better than on the coast but far from satisfactory. The present hunting possibilities are due principally to Catahoula Lake, the recreational impoundments bordering Red River, the Mississippi River proper, and the Marshy Boeuf area near Monroe which is owned by a corporation but not posted to the public. The hunting opportunity in north Louisiana is being lessened by a reduction of hunting areas through drainage and improper water level management as well as the daily posting of additional hunting areas.

The principal aim of the waterfowl habitat survey program at this time is to locate additional areas in the state that may be economically developed as waterfowl areas in north Louisiana, Lake Bistineau, Black and Saline Lakes, Catahoula Lake, and the Mississippi River. Reports were written for the improvement of Lake Bistineau and Black and Saline Lakes, based on findings of research conducted in improvements in other states and at Catahoula Lake.

Catahoula Lake is the most important single waterfowl area of its size in the state except perhaps the Delta Refuge at the mouth of the Mississippi River. During normal years, it provides an excellent food supply and resting area for a large percentage of the ducks that pass through Louisiana. Conditions on Catahoula Lake also decide the quality of the hunting in much of north and central Louisiana since it attracts most of the ducks that winter in this section of the state.

The factor that produces the food supply on Catahoula Lake and provides a basis for waterfowl management on other areas in north Louisiana is the manner in which water levels naturally fluctuate on the 21,000 acre area.

Water stands over the vast flat lake bed to a variable depth of as much as thirty feet from late December to late August, after which the lake bed becomes dry for the most part. As the mud flats become exposed, the food producing plants begin to grow in profusion and the lake bed resembles a pasture. After the grasses and sedges mature and form seed the water normally begins to reflood during early November, creating an excellent available food supply.

This plan of management may be applied in a modified form to many areas in north Louisiana where water level control can be exercised by use of floodgates. Exposing mud flats by opening the gates of impoundments during August, September and October would provide a place for grasses to grow and produce seed or tubers. The natural food supply produced by fluctuating water level will then attract waterfowl during the fall after the floodgates are closed to reflood the mud flats.

It would not be necessary to remove all of the water from the management area during the late summer. A conservation pool could be held in order to maintain a breeding fish population for the spring spawning season. This plan of water level management is widely recommended by fishery research biologists for maintaining good fishing indefinitely in impoundments. It is now known that good fishing may be obtained in stable water level impoundments for only three or four years following the lake formation. After that time a loss of water fertility occurs and good fishing begins to fail. This fertility can be maintained best by fluctuating water levels during the late summer and this fits in perfectly with the production of high quality food for waterfowl.

At present, three areas in the coastal marsh and one area in north Louisiana have been selected as possibilities for acquisition and development as waterfowl public shooting grounds. Plans are now being made to acquire these areas but the success of this project will not be known until landowners have been contacted and satisfactory agreements have been drawn up.

Waterfowl Population Studies

In gathering information on waterfowl population during the winter of 1950, weekly censuses were made by boat on Catahoula Lake, Black and Saline Lakes, Lake Bistineau, and a section of the Mississippi River. During the winter of 1951, censuses were made by airplane on all of the important areas every ten days in north Louisiana and every fifteen days in the coastal marshes.

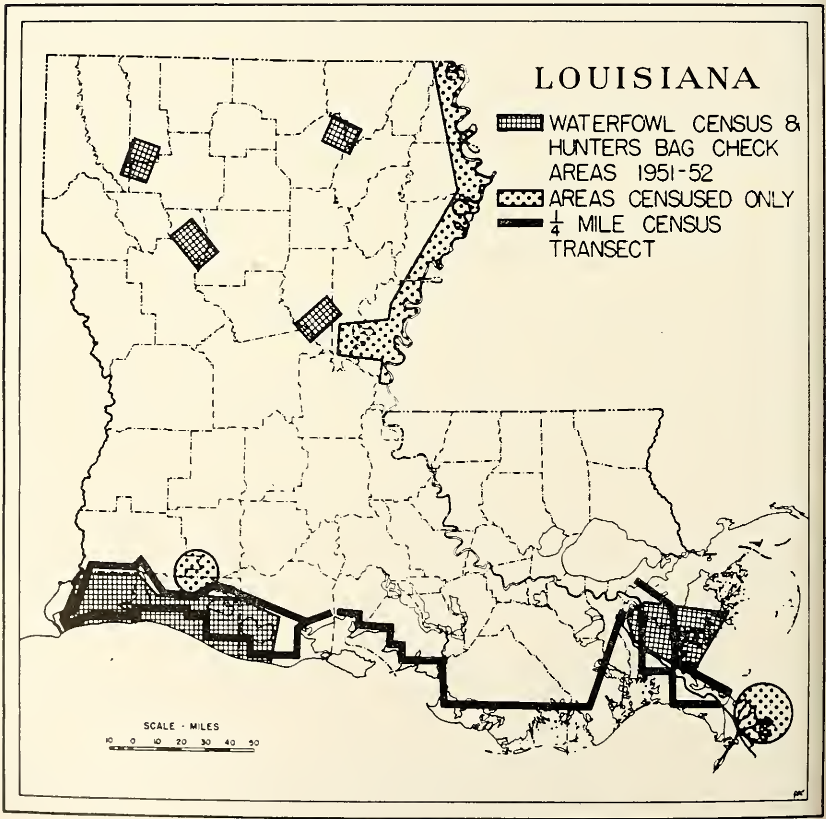
The principal reason for gathering this information is to determine the most appropriate time for setting the hunting season.

At this time, many theories have been formed concerning flights of waterfowl into the state, but additional years of census work will be required before absolute conclusions can be derived. Census records for the past three years indicate that Louisiana experiences several major movements of waterfowl that occur about the same time each year. Once these flights have been definitely established on paper, the setting of the hunting season should be a reasonably simple matter. Some of the flights that appear to occur regularly may be briefly described as follows. The vanguard of the early blue-winged teal flight reaches Louisiana between August 15 and 25 and the population builds up until mid-October. By early November, the blue-winged teal population, for the most part, has left the state and does not reappear in large numbers until early March. The population then begins to build up again until early April, when the major spring flight begins through north Louisiana. Some pintails move in with the blue-wings during the early fall, but this flight is very erratic and has been difficult to trace.

The blue goose flight has occurred regularly at the same time each year. The first flocks appear on October 15, but the major flights pass through north Louisiana between October 25 and October 30. A very small percentage of these geese pause in north Louisiana, while the others go straight to the wintering grounds in the coastal marshes. The spring migration generally begins for the blue goose in late February and continues throughout March.

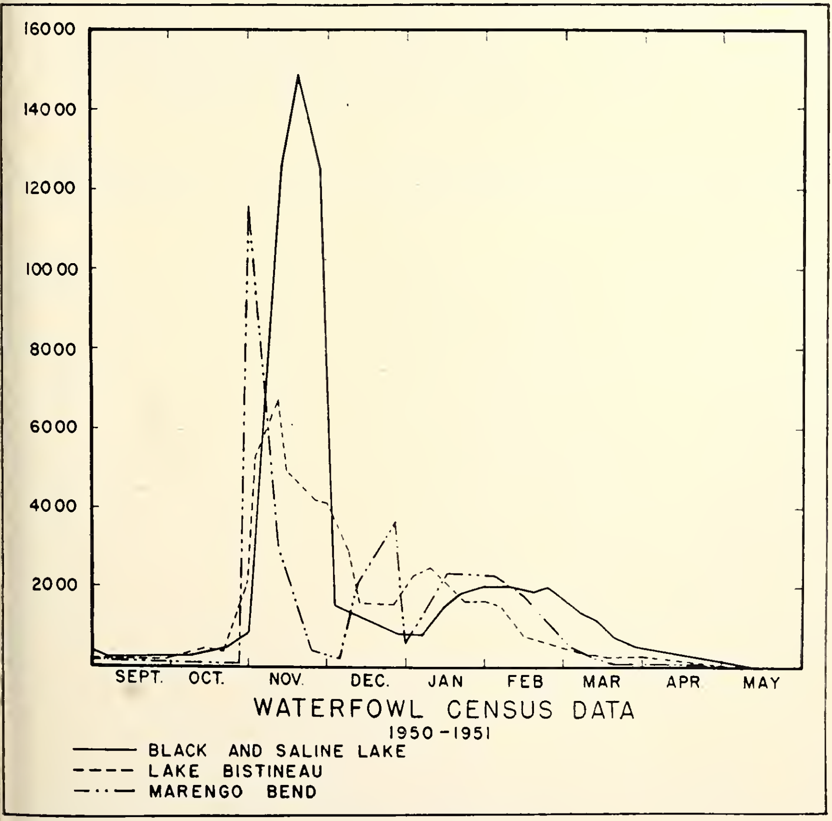
The first major flight of ducks occurs between October 28 and November 1. This early flight, as it appears in north Louisiana, is composed principally of gadwalls, green-winged teal, baldpates, shovellers, and diving ducks. The length of time this flight remains in north Louisiana seems to depend upon food and water conditions. The first large flights of mallards arrive in north Louisiana between November 7 and November 18. New arrivals of mixed species continue to trickle into the state until about December 7, when another major flight of mallards arrives in the state. By December 16, Louisiana contains most of its wintering resident waterfowl population.

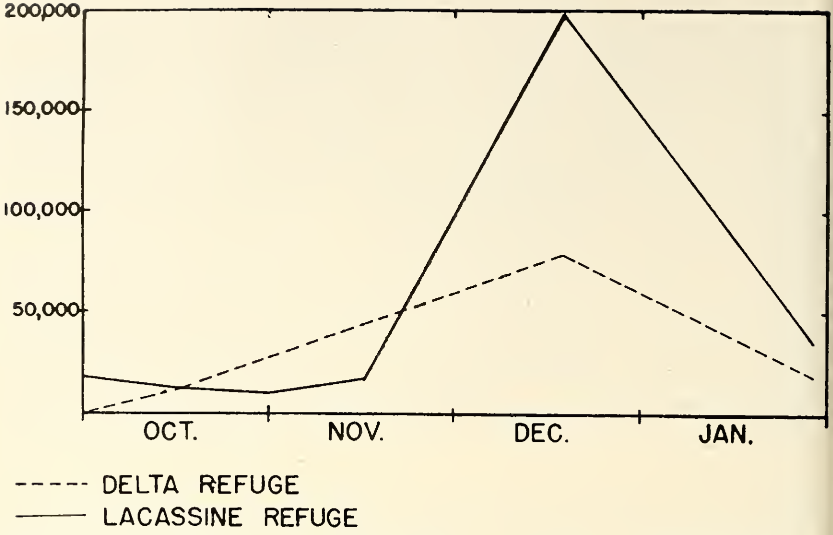
In regard to total numbers of ducks and geese, Louisiana and offshore waters contain a waterfowl population of slightly over 1¼ million ducks and 275,000 geese during the January 1952 inventory.



LOUISIANA GEOLOGICAL SURVEY

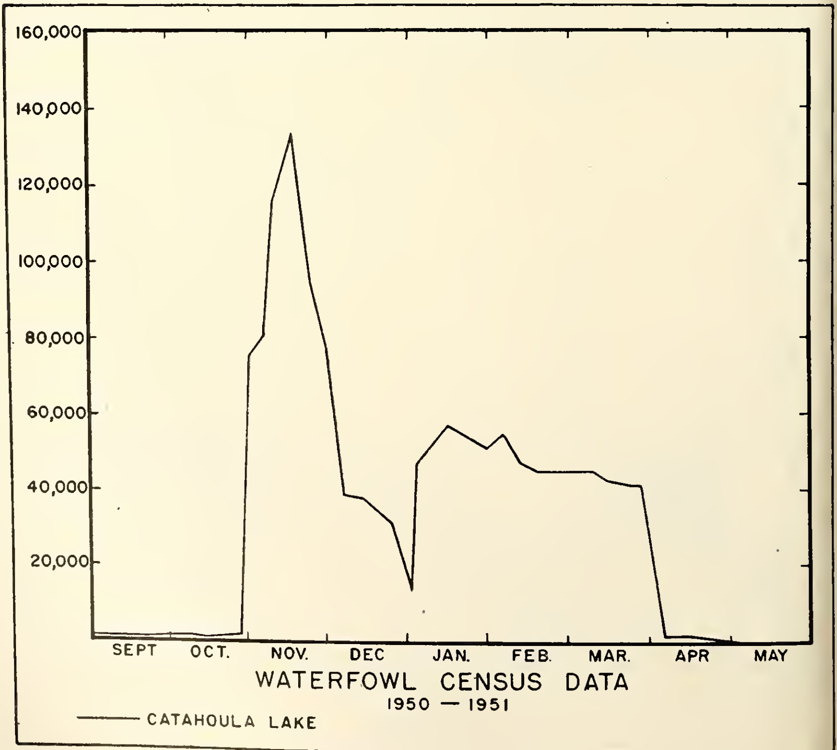
The map and graphs on the following pages are believed to be self-explanatory. The map of Louisiana shows the areas covered by both censuses and hunter bag checks. The graphs showing the rise and fall of duck population in the coastal marsh is based on ducks per square mile. The census route shown on the map covers 145 square miles in the coastal marshes and this figure was divided into the number of ducks seen within the census transects during each census to determine the number of ducks per square mile. This ducks per square mile figure was then plotted on the graph over the time of month the census was made in order to determine the rise and fall of population during the fall and winter. The other population graphs were drawn up from total counts made on the specified areas during the past two years.





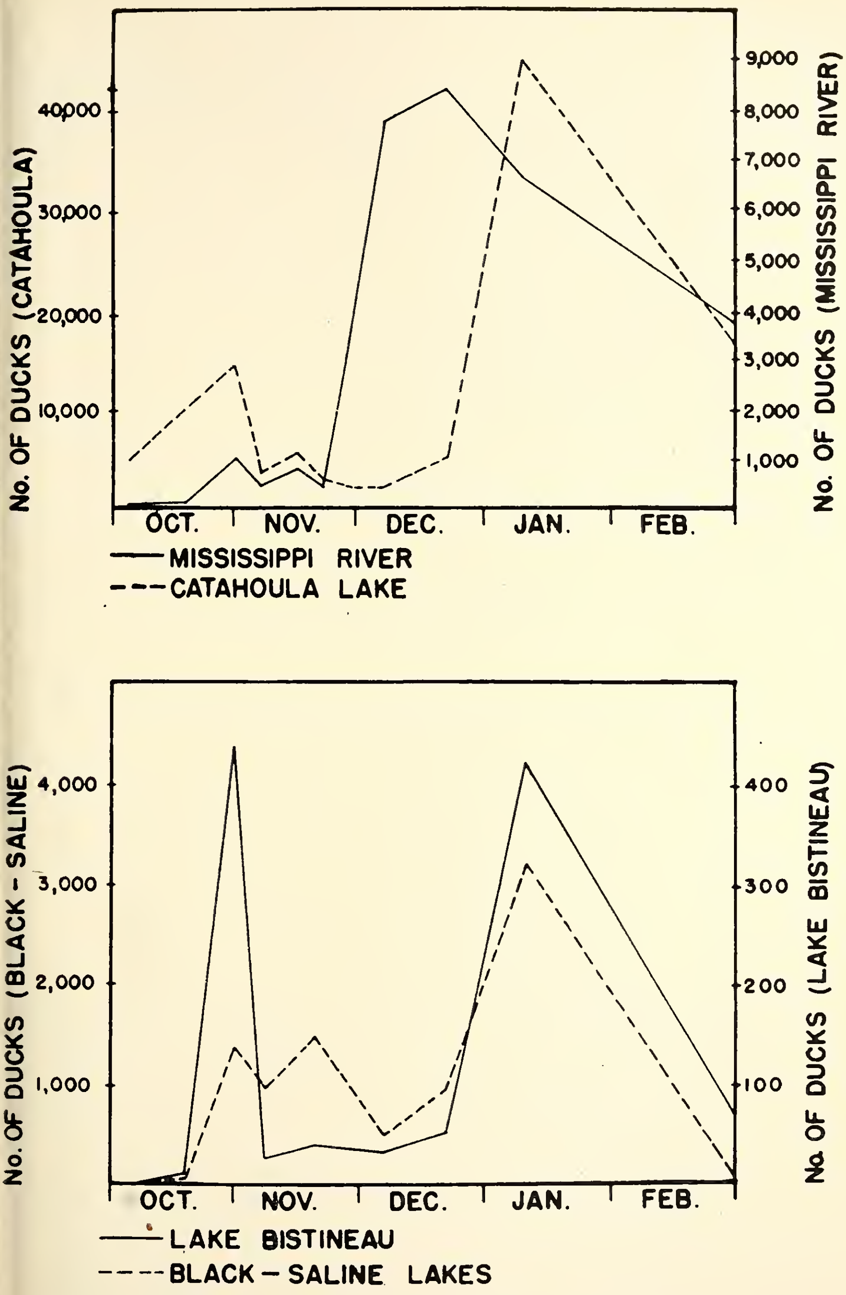
WATERFOWL CENSUS DATA 1951-52

TOTAL COUNT - DELTA & LACASSINE REFUGES

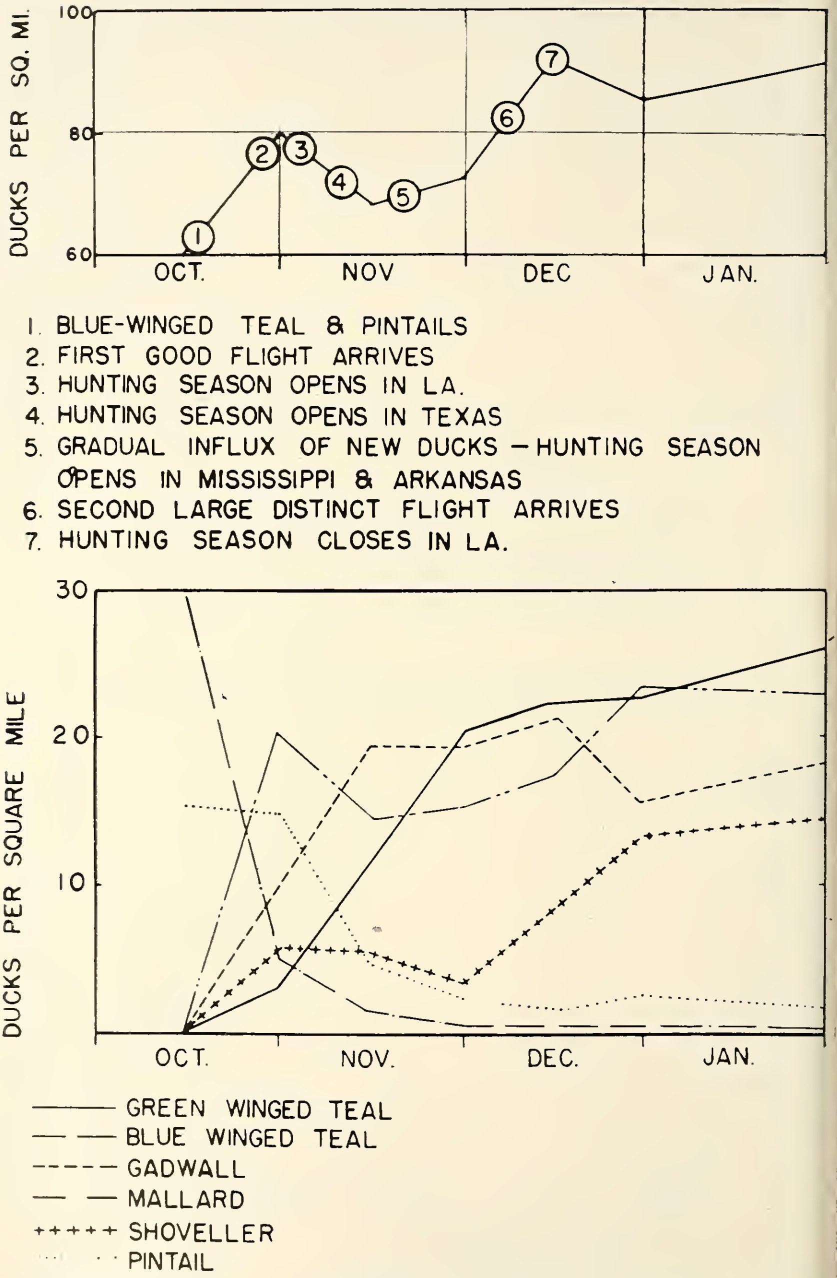


WATERFOWL CENSUS DATA

1950 — 1951



WATERFOWL CENSUS DATA 1951-52



WATERFOWL CENSUS DATA 1951-52
COASTAL MARSHES

Hunting Pressure

The hunting pressure and waterfowl kill in Louisiana was measured by a system of hunter bag checks during the 1950 and 1951 duck seasons. Information was obtained by interviewing duck hunters at road intersections, boat landings, and public ferries. The hunters were asked to cooperate in the waterfowl survey by allowing a biologist to check their kill. A record was kept of the number of hunters, the hours they hunted, whether morning or evening, and their kill by sex and species. The same check stations were maintained on opening days and weekends throughout the season in order to secure an adequate and unbiased sample.

The 1950 hunting season of thirty-five days extended from December 2, 1950, to January 5, 1951. At this time bag check stations were operated in north and central Louisiana on Lake Bistineau, Black and Saline Lakes, Catahoula Lake, and Marengo Bend. A total of 2,293 bag checks were made during the 1950 season.

The forty-five day 1951 season extended from November 2 through December 16. Bag check points included those listed above plus a check station in southeast Louisiana at Violet and two in southwest Louisiana at the Creole and Hackberry Ferries crossing the Intracoastal Canal. The stations were maintained each weekend and 7,058 bags were checked. The detailed results of the bag checks for the 1950 and 1951 season are given in the accompanying tables. The increase in checks was made possible by a longer season and an increase in personnel.

Data for the 1950 season shows that 2,293 bags were checked with 4,373 ducks taken. The table shows that mallards were the species most taken, making up 50 per cent of the north Louisiana kill. The ring-necked duck, green-winged teal, and wood duck followed in order of importance. The 1951 data is based on 7,058 bag checks with a kill of 11,212 ducks. Mallards were again tops, followed by ring-necked ducks, green-winged teal and pintail. Although still first, the mallard kill was down, comprising only 22 per cent of the total kill during the early season on the same areas that were checked during 1950. This was anticipated from past census records since mallards do not arrive in large numbers until mid-November.

WATERFOWL HUNTER BAG CHECKS

December 2, 1950—January 5, 1951

	Catahoula Lake	Saline, Black Lake	Marengo Bend	Lake Bistineau	Total
No. hunters, 12/2/50-1/5/51	563	745	36	938	2,293
Man-hours hunted	1,790	2,164	129	4,026	8,109
No. birds taken					
Mallard	455 M* 514 F*	756	12	596	2,233
Pintail	62 M 91 F	42		26	221
Shoveller	24 M 31 F	18	2	11	86
Baldpate	3 M 9 F	3		4	19
Gadwall	1 M 4 F	43	10	29	87
Black duck	1 M	6			7
Blue-winged teal	1 M 1 F	5		5	12
Green-winged teal	101 M 83 F	58	4	85	331
Wood duck	2 M 10 F	180	3	70	265
Redhead	1 M 2 F			9	12
Canvasback	27 M 34 F	9		2	72
Scaup	5 M 8 F	14	1	17	45
Ringneck	4 M 10 F	208	5	619	846
Bufflehead	1 F	11			12
Ruddy duck	12	3			15
Hooded merganser	1 M 4 F			5	10
Total ducks	1,502	1,356	37	1,478	4,373
Blue geese	4				
Coots	7	161		77	245
Unretrieved ducks	104	242	5	300	651
Banded ducks shot last year	1				
No. of these not reported	0				
Average kill per hunter per hunt	2.66	1.8	1	157	
Per cent unretrieved ducks	7%	18%	14%	17%	14.9%

WATERFOWL HUNTER BAG CHECKS

November 2, 1951 to December 16, 1951

	State-wide Totals	Northwest Louisiana Totals		Northeast Louisiana *Black Bayou Lake †Lafourche Swamp	Central Louisiana †Catahoula Lake	Southwest Louisiana †Coastal Marshes	Southeast Louisiana †Coastal Marshes
		*Lake Bistineau	*Black and Saline Lake				
No. bag checks	7,058	871	797	685	1,395	2,497	813
No. ducks killed	11,212	722	1,637	1,059	1,755	4,336	1,702
Average ducks killed/ man/day	1.55	.83	2.05	1.54	1.26	1.73	2.15
Crippling loss	1,602	70	375	125	23	726	283
Total hours hunted	27,468	3,816	2,536	2,788	5,218	9,856	3,254
No. hours per duck killed	2.45	5.3	1.5	2.6	3.0	2.27	1.8
No. geese killed	606	...	...	2	58	538	8
Average goose kill/man day	.085	...	...	trace	.041	.22	trace
No. coots killed	1,629	183	187	27	307	488	437
Average coot kill/man day	.23	.21	.23	.04	.22	.30	.54

* Bag checks were made at public boat landings.
† Bag checks were made at road intersections and highway ferries.
Northwest Louisiana bag checks were made during the opening week only.
Checks were made at the other areas throughout the season.

HUNTER BAG CHECKS
WATERFOWL

Date: 2 Nov '51 - 16 Dec '51

County and Area: State of Louisiana.
Checked by: Of 4,893 ducks checked for a.m. or p.m. kill, 4,436 were killed during the a.m. and 457 in the p.m.

	Southwest Louisiana		Central Louisiana		Southeast Louisiana		Northwest Louisiana		Northeast Louisiana		Total	
Number of Hunters in Party	2,497*		1,395*		813*		1,668†		685†		7,058	
Man-Hours Hunted	9,856		5,218		3,254		6,352		2,788		27,486	
Unretrieved ducks	726		23		283		445		125		1,602	
Number of birds taken	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Mallard	756	939	184	265	132	212	255	213	251	264	1,578	1,893
Pintail	140	198	302	302	53	66	40	57	18	28	553	651
Green-winged teal	247	350	241	124	86	117	43	42	28	34	645	667
Shoveller	163	278	23	25	36	76	5	9	10	24	237	412
Baldpate	74	112	34	34	17	27	3	5	6	4	134	182
Cadwall	141	178	28	29	157	157	46	69	2	15	374	448
Black duck	....	....	....	2	23	19	....	1	6	7	29	29
Wood duck	8	7	4	2	....	1	88	115	102	58	202	183
Redhead	11	17	2	1	10	3	....	....	3	1	26	22
Canvasback	13	22	18	9	4	6	30	33	24	14	89	84
Blue-winged teal	46	121	12	15	37	62	1	14	5	7	101	219
Scaup	80	64	40	42	147	187	48	24	57	63	372	380
Ringneck	41	56	5	4	5	5	636	581	14	4	701	650
Ruddy	3	15	1	2	1	8	2	....	2	6	9	31
Mergansers	7	17	1	4	11	19	....	....	....	2	19	42
Mottled ducks	171	59	....	....	7	11	....	....	....	....	178	70
Total Ducks	1,901	2,433	895	860	719	976	1,197	1,163	528	531	5,247	5,963

HUNTER BAG CHECKS—(Continued)

Number of Hunters in Party	SOUTHWEST LOUISIANA 2,497*		CENTRAL LOUISIANA 1,395*		SOUTHEAST LOUISIANA 813*		NORTHWEST LOUISIANA 1,668†		NORTHEAST LOUISIANA 685†		TOTAL 7,058	
Man-Hours Hunted	9,856		5,218		3,254		6,352		2,788		27,486	
Unretrieved ducks	726		23		283		445		125		1,602	
Number of birds taken	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Goldeneye	2	4,334		1,755		1,702		2,360		1,059	11,212	
Canada goose	30										30	
Blue goose	436			56		8				2	502	
Snow goose	71			1							72	
White-fronted goose	1			1							2	
Other												
TOTAL GEESE	538			58		8				2	606	
Coots	488			307		437		370		27	1,629	
Other Birds	1										1	
Unretrieved geese	7			2							9	
Banded Ducks Shot Previous Year 1950	13			10 d. 1 g.						15 d. 1 g.	38 d. 2 g.	
Number of 1950 bands Not Reported	8			1 d.						3 d.	12 d.	

Black ducks, Cadwalls, shovellers, and mottled ducks were not sexed.

Black ducks and mottled ducks may be considered under one total since the two species were not spearated with accuracy.

*Bag checks were made at road intersections and ferries.

†Bag checks were made at public boat docks.

SPECIES KILL

11,210 Ducks

Per Cent of Total

Species	State-wide	Northwest Louisiana		Northeast Louisiana Black Bayou Lake Lafourche Swamp	Central Louisiana Catahoula Lake	Southwest Louisiana Coastal Marsh	Southeast Louisiana Coastal Marsh
		Lake Bistineau	Black and Saline Lake				
Mallard	31.0	17.3	20.8	48.5	25.7	39.1	20.0
Ring-necked duck	12.0	46.8	53.9	1.7	.4	2.2	.6
Green-winged teal	11.8	4.5	3.1	5.8	20.9	13.8	11.9
Pintail	10.7	2.4	4.8	4.3	34.5	7.9	6.9
Gadwall	7.3	5.8	4.5	1.6	3.2	7.3	18.3
Scaup	6.8	1.5	3.7	11.7	4.9	3.4	20.0
Shoveller	5.7	1.5	.2	3.2	2.7	10.2	6.8
Wood duck	3.4	17.1	5.0	15.5	.3	.3	trace
Baldpate	2.9	1.0	...	.9	3.9	4.3	2.6
Blue-winged teal	2.8	1.8	.1	1.1	1.5	3.8	5.8
Black and mottled duck	2.7	trace	...	1.2	trace	5.3	3.5
Canvasback	1.5	...	3.9	3.6	1.5	.8	.6
Mergansers	.6	...	...	trace	.2	.6	1.8
Redhead	.4	...	...	trace	trace	.6	.7
Ruddy	.4	.3	...	.8	trace	.4	.5

GEESE

Per Cent of Total

Blue	82.8	...	...	trace	9.5	89.2	1.3
Snow	11.9	...	...	...	1.8	98.2	...
Canada	5.0	...	...	...	...	100.0	...
White-fronted	.3	...	...	...	...	...	...

Hunter success on the various areas was comparable from one year to the next since it was expressed as ducks per hunter per day. The included tables give all the details, but a few examples follow. On Catahoula Lake, the hunters averaged 2.66 ducks per hunter per day in 1950. In 1951, it fell to 1.26 ducks per hunter per day. Lake Bistineau showed a similar decline from 1.57 ducks per hunter day in 1950 to .83 duck per hunter per day in 1951. Black and Saline Lakes experienced a slight increase in kill. Hunters collected 1.8 ducks per man day in 1950 and 2.05 in 1951.

In general, the 1951 season provided poor shooting with a subsequent low kill. Low water levels resulting from a summer drought, late hunting season in the surrounding states, and mild winter weather were major factors contributing to the low season kill. Catahoula Lake, in particular, was affected by the extremely low water conditions. Water levels did not rise until the last two weeks of the season and food supplies generally remained unobtainable. The 1951 resident duck population did not approach that attained during the 1950 season in north Louisiana at any time during the winter.

Wood Duck Nesting Boxes

During the spring of 1951, periodic checks were made on 58 nesting boxes that have been placed on the areas listed below. The results are listed as follows:

WOOD DUCK NESTING BOX DATA—SPRING OF 1951

	Number of Boxes	Used by Ducks	Destroyed by Gray Rat-Snake	Used by Others
Lake Bistineau	18	14	3	1 (Screech owl)
Saline Lake	10	2	1	1 (Sparrow hawk)
Black Lake	10	5	2	0
Lake Concordia	3	3 (1 hooded merganser)	0	0
Fletchers Lake	11	8	2	2 (Fox squirrel)
Fletchers Lake	6 placed on April 1	4	0	1 (Screech owl)
TOTAL	58	36	8 nests contained 12 snakes	5
Per Cent of 58 Boxes		62%	22%	11%

In studying the difference in area usage, it was evident that where abundant natural nesting sites are to be found, such as in Saline Lake, there is little need for nesting boxes. The wood duck boxes on all areas were placed in a similar manner against the boles of cypress trees, 20 to 30 feet above the water.

The periodic nesting checks revealed that the north Louisiana wood duck lays its first eggs during late February and requires an average incubation period of 27 days. It also showed that the average clutch contains 13 or 14 eggs with a maximum limit of 18.

Four out of six boxes placed April 1 on Fletchers Lake were being used within two weeks time. This indicates that the ducks are still attempting to nest or renest as late as the middle of April.

Twelve gray rat-snakes, killed in nesting boxes during the study, destroyed 8 nests or 22 per cent of the total number. It is assumed that the percentage of destroyed nests by this predator will be even higher in the natural nesting cavities which appear to be much more accessible to such a versatile climber. Some of the destroyed nests were more than one-fourth mile from shore.

One of the nesting boxes on Lake Concordia was used by a hooded merganser. The merganser began nesting about March 1, and layed and hatched out 16 eggs. This is believed to be one of the first authentic records of the hooded merganser nesting in Louisiana, although these birds are commonly seen during the summer.

Ninety additional boxes were placed during February of 1952.

Experimental Waterfowl Food Plantings on Marengo Bend

During August of 1950, experimental waterfowl food plantings were made on mud flats in the Marengo Bend section of the Mississippi River. A 100-acre planting was made on the exposed mud flats, using wild millet, chufa, buckwheat, Italian rye grass, and sesbania. All plants, except chufa, germinated well and grew rapidly. In mid-September the river jumped to a high river stage for the first time on record at this time of year and remained high until the first of October. All of the plantings were drowned and the experiment was unsuccessful.

Since these plantings were made, it has become increasingly clear that the artificial propagation of waterfowl food plants is not the proper means for making Louisiana more attractive to ducks and geese except in areas of a limited nature. Plantings are costly and it is seldom that the results will justify the cost. Proper control of ecological factors such as water levels which in turn encourage natural growth of duck food plants will be the means for obtaining *large scale results* in the future. A short discussion of water level control is included in this report using Catahoula Lake as an example that may be followed on several areas in north Louisiana where water levels control can be exercised.

Food Habit Studies

A total of 214 stomachs were analyzed from ducks collected during the 1950 season in north Louisiana. The majority of stomachs examined were from mallards, green-winged teal, gadwalls, and ring-necked ducks. The information obtained is local in nature but gives an idea of food habits in north Louisiana. The principal foods found in their order of use were chufa (*Cyperus esculentis*), smartweed (*Polygonum sp.*), buttonbush (*Cephalanthus occidentalis*), millet (*Echinochloa walteri*), duckweed (*Lemma minor*), and shellfish (*Gastropoda*). Because the food habits of wood ducks differ markedly from that of other ducks, it is necessary to list their foods separately. The principal foods found in wood duck stomachs were pecan (*Carya pecan*), cypress (*Taxodium distichum*) and willow oak (*Quercus phellos*).

Experimental Plant Control on Catahoula Lake

Experimental sprayings were made on two adjacent areas in the Big Bend section of Catahoula Lake for the control of water elm (*Planera aquatica*) and swamp privet (*Forestieria acuminata*). These two brush species occupy an estimated 3,000 acres of mud flats around the edge of the lake that are potential waterfowl food producing areas. The highest mud flats, and therefore those with the longest growing season and least danger of flooding, are covered by water elm and swamp privet under which only a mediocre food supply grows. It is believed that if satisfactory experimental control techniques are developed for these woody species, future control would be well worth while. Results of the spraying will not be obtainable until the summer of 1952.

PROJECT 24-R, EVALUATION OF WILDLIFE MANAGEMENT PRACTICES IN LOUISIANA

Introduction

This project was initiated on July 1, 1950. Since the development project (23-D) has become vast in scope, project 24-R has been set up for the purpose of evaluationg various management practices being employed on the state wildlife refuges. Life histories and food habit studies of deer, turkeys, and squirrels are other objectives of this project.

With the exception of the Red Dirt National Wildlife Preserve and the Catahoula National Wildlife Preserve where detailed investigations have begun, observations by the department personnel and records maintained by the refuge managers have been the main source of information for this project to date.

Deer Condition on State Refuges

Deer are released on refuges that are not believed to have sufficient breeding populations for satisfactory maintenance and increase. Project 23-D gives complete release data.

The refuge managers and other department personnel maintain daily records of all deer seen and tracks observed. From the observation it can be determined whether the deer are fawns, yearlings, or adults, and from the correlation of the deer index studies on the Catahoula Wildlife Refuge and the Red Dirt Game Refuge with results of daily observations it is evident that deer are reproducing and apparently the population is on the increase on all the state game preserves. Deer index studies are being carried out on the Red Dirt and Catahoula Game Preserves. These studies on the Red Dirt preserve indicate that the size of the population in 1951 has increased by approximately 31.7 per cent over the number of deer on the area in 1950. The population study on the Catahoula preserve over the same period revealed no significant change in number of deer on that area; however, the legal kill by hunters within one mile of the refuge boundary during the 1951 season was 16 per cent higher than during the previous season of 1950.

For the purpose of obtaining pertinent information on the reproduction and food habits of deer, a deerproof fence enclosing approximately 80 acres is under construction on the Red

Dirt Game Refuge in Natchitoches Parish. The enclosure is divided into two tracts of equal size; in one of these areas two does are to be enclosed for the food habit studies, whereas, in the other tract of 40 acres two does and one buck are to be enclosed for the purpose of studying reproduction.

On most of the game preserves, plots averaging from four to five acres in size have been established for the purpose of planting supplemental foods for game species, primarily deer and turkey. Appropriate sites throughout the areas were selected and hogproof fences constructed around them where necessary. Suitable foods such as wheat, clover, and Austrian winter peas were planted in order to provide additional sources of food during the more critical periods of the year. Bimonthly checks of each food plot which are made indicate good utilization of these supplemental foods, especially by deer.

Turkey Conditions on State Game Refuges

Approximately one thousand wild turkeys have been released on the wildlife refuges in Louisiana during the period from 1950-1952. For the exact number released on each game preserve see report of Project 23-D.

Concerning the survival, establishment of range, and reproduction of wild turkeys, success is apparent on some of the game refuges, but success or failure has been difficult to ascertain on others. Noticeable success has been observed on the Catahoula National Wildlife Preserve, the Union Parish Game Preserve, the Caldwell Parish Game Preserve, and the Livingston Game Preserve. Flocks varying in size are frequently observed on these areas, and observations indicate that turkeys have established range in and around the four areas listed above. During the nesting season of 1951, nests were found either in or around these refuges, and flocks of young turkeys were frequently observed thereafter.

Deer Browse Investigation

A deer browse survey to determine the effects on the range as a result of browsing has been carried on for the past two years. To date this survey has been carried on only on the Red Dirt and Catahoula Game Preserves, but plans have been made to extend it to all the wildlife refuges under the Pittman-Robertson supervision in Louisiana. At the present time the populations are not sufficient in size to overbrowse any important species of plant; however, some of the more significant plants being utilized at the present time on the areas being studied are: greenbriar (*Smilax spp.*), whitebay (*Magnolia virginiana*), azalea (*Rhododendron canescens*), French mulberry (*Callicarpa americana*), possumhaw viburnum (*Virburnum nudum*), sweetleaf (*Symplocos tinctorum*), and blackberry (*Rubus spp.*).

Mast Study

During the past two years an acorn mast study has been in progress on the Red Dirt and Catahoula Game Preserves. This study is of considerable importance since acorns are a major food item of deer, turkeys and squirrels. The objectives of this study are to determine the production and utilization by game animals of the acorns produced by the various species of oaks occurring in the two areas under study, and the effects of release cutting on the mast production.

The species under consideration are blackjack oak, sandjack oak, post oak, southern red oak, water oak, willow oak, and white oak.

The period of study is from September 1 to January 31 each year, and this is planned to continue until conclusive results are obtained.

The method of study is as follows: collecting traps have been placed under each tree being studied, and the acorns are removed from the traps weekly. From the number collected the trees' production and the soundness of the acorns are determined.

Squirrel Investigation

In addition to the deer and turkey investigations, a squirrel study was initiated on January 1, 1952. It is believed that since the State of Louisiana is releasing Wisconsin squirrels, and since the protection and management of squirrels is a part of our present refuge system, that certain investigations should be undertaken to ascertain the effect of release and protection on refuge. In addition to this, the importance of squirrels as a game animal necessitates that certain basic information such as life history, movements, populations, and food habits be studied. It is also believed that information concerning the effect of refuges on squirrel population in surrounding hunted areas will show the value, if any, of the refuge system for squirrels. A system of trapping, tagging, dyeing, and studying squirrel movements on and off refuge areas in correlation with population index on and off the refuge areas should give important information concerning the value of refuges in aiding surrounding squirrel populations.

To date, there have been 87 squirrels dyed green, ear-tagged, and released on the Sabine Parish Game Refuge. On the West Bay Game Refuge in Allen Parish approximately 80 squirrels were released in a similar manner. The sex ratios were approximately 50-50 on both refuges. During the coming hunting season, ample publicity will be given to this tagging and dyeing program so that as many returns may be obtained as possible. From such information the migration and spread of the squirrel population will be traced.

LAND DEVELOPMENT

Supervisor: Carroll J. Perkins

PROJECT 6-D, FARM GAME HABITAT IMPROVEMENT

Leader: Charles R. Shaw
Assistant: Jack Sims
Assistant: Kenneth C. Smith
Assistant: Frank E. Darsey (resigned 2/15/52)
Assistant: Glenn Futch (resigned 1/15/52)

PROJECT 14-D, DEER TRAPPING AND TRANSPLANTING; LAND ACQUISITION; AND PURCHASE OF GAME FOR RESTOCKING

Leader: Flavil D. Hollis

PROJECT 23-D, DEVELOPMENT OF WILDLIFE MANAGEMENT AREAS

Leader: Carroll J. Perkins
Assistant: Clyde E. Harrison
Assistant: Rowland P. Vernon
Assistant: Flavil D. Hollis

Project 6-D, Farm Game Habitat Improvement

Under present-day agricultural practices the presence or absence of game on the farm will in a large measure depend directly on the interest and efforts of the farm operator. By proper practices it is possible to increase the available game, but on the other hand a lack of attention to the needs of wildlife will, in most instances, lead to its decrease or disappearance. Recognition of this led to the start of the farm game habitat improvement work in 1942 with the distribution of a small amount of sericea lespedeza seed to a few Soil Conservation Service work units. In 1943, 28 parishes participated, using 48,550 pounds of sericea seed and 388,400 pounds of commercial fertilizer. During the next three years the war effort precluded any expansion of the program. However, in 1946, six S. C. S. work units planted 531 pounds of lespedeza bicolor seed and 1,760 pounds of sericea seed, using 15,500 pounds of fertilizer. Fertilizer distribution was discontinued in 1947, but sixteen S. C. S. work units planted 4,000 pounds of bicolor and 1,064 pounds of sericea, plus 30,000 bicolor seedlings.

In 1948, an assistant project leader and additional equipment were added to the program. Bicolor seedlings were purchased

FIGURE 1—Personnel of the DeRidder Work Unit of the Soil Conservation Service leveling the planting area on the bicolor nursery at DeRidder.

FIGURE 5—Lifting, counting and bundling lespedeza bicolor seedlings on the bicolor nursery at DeRidder.

FIGURE 5—Lifting, counting and bundling lespedeza bicolor seedlings on the Bicolor Nursery at DeRidder.

from Georgia and sixteen S. C. S. work units planted 217,000 bicolor seedlings and 3,800 pounds of sericea seed. The original project leader resigned in July.

In 1949, plans were made to plant one million seedlings through 38 S. C. S. work units and 21 Agricultural Extension Service parish offices but a poor season cut the available supply to 20 per cent of that and 35 S. C. S. work units planted 145,600 seedlings and 25 Agricultural Extension parish offices planted 57,600. A total of 4,350 pounds of sericea seed was distributed also. The increasing cost of the planting material, plus the uncertainty of delivery, led to the establishment of a bicolor nursery in Louisiana, to be under the direction of the new assistant project leader, Jack Sims. The Soil Conservation Service rendered invaluable aid through the soil scientist, engineer and the cooperation of the DeRidder work unit and Calcasieu Soil Conservation District. The site was secured free of charge from the Beauregard Parish police jury, who also made some equipment available for use on the nursery.

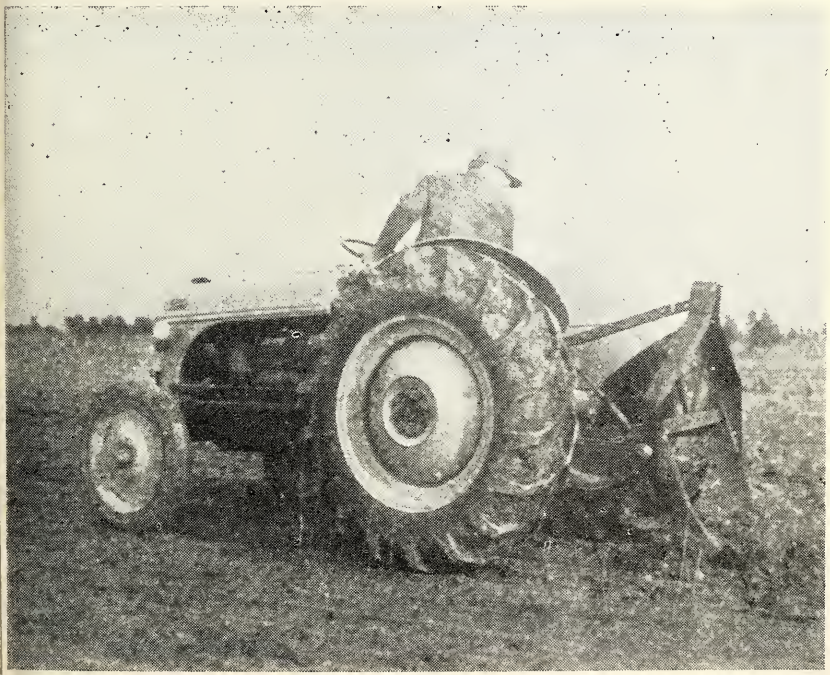


FIGURE 4—Using lespedeza bicolor lifter on the bicolor nursery located at DeRidder. This photograph shows the mechanics of the lifter.

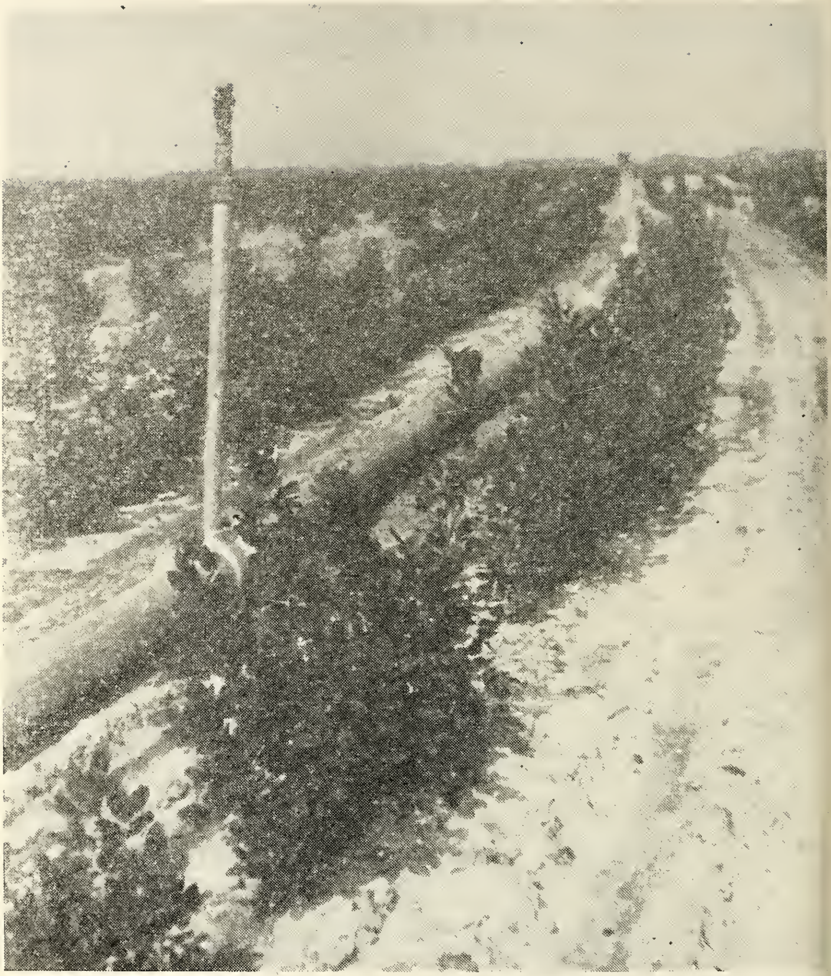


FIGURE 3—Lespedeza bicolor seedlings growing on the Bicolor Nursery at DeRidder about the middle of the growing season. Sprinklers are set 40 feet apart along the 4-inch lateral lines of the portable irrigation system.

The year 1950 started off very favorably for the farm game habitat improvement program. The project leader and assistant drove to Georgia in a two-ton truck and picked up a load of one million lespedeza bicolor seedlings, which were distributed over the state through the Agricultural Extension Service and the Soil Conservation Service. This year the distribution of the lespedeza bicolor seedlings became somewhat involved. The ma-

FIGURE 6—Loading lespedeza bicolor seedlings for delivery to the parishes.

terial delivered to the Agricultural Extension Service was on a parish basis and presented no complications. The material going to the S. C. S. goes to work units which do not follow parish lines, and 161,000 seedlings being distributed directly from the S. C. S. nursery complicated the picture as some work units received their entire needs from the S. C. S. nursery, some from Project 6-D and some from both. Our figures do not include material delivered directly by the S. C. S.

The Agricultural Extension Service distributed 536,500 bicolor seedlings in 41 parishes for an average of just over 13,000 per parish. The distribution by the S. C. S. covers some of the same parishes and also others, so that 55 parishes participated in the program in 1950. Of the nine which did not, one (Orleans) is urban, and six others lie at least partially in the coastal marsh region. Thirty-four S. C. S. work units distributed 461,000 seedlings through this program for an average of 13,588 per work unit, or slightly higher than the average for the extension service. Sericea was distributed at the rate of five pounds for 1000 seedlings.

Even with the whole-hearted assistance of the Soil Conservation Service, a tremendous amount of work was necessary to set up the bicolor nursery and place it in readiness for operation in 1951. The addition of two assistants in February made it possible to divide the state into four districts, with the more experienced man, Sims, being placed in charge of the southwest district and the bicolor nursery. The new men were assigned to the northwest and northeast areas, where the work is well established. The lack of technical supervision before planting (the new men were not hired until February) and a serious flood curtailed the effectiveness of the habitat improvement program considerably, particularly in the northeast district. In July, ar-

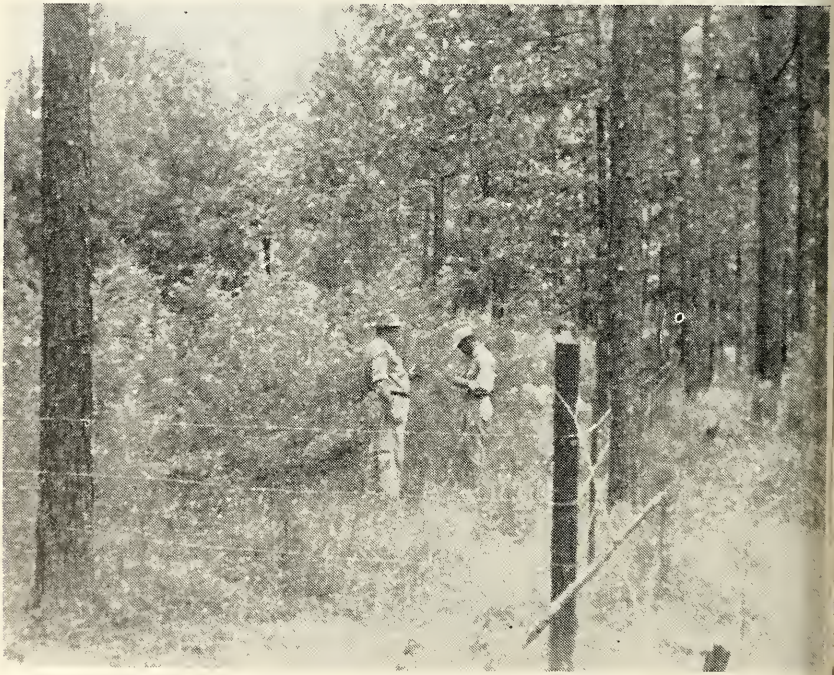


FIGURE 7—Work Unit Conservationist of the Soil Conservation Service and Assistant Project Leader examining lespedeza bicolor field border in Tangipahoa Parish.

FIGURE 8—Assistant Project Leader checking utilization on lespedeza birolor field border in Union Parish in fall of 1950.

rangements were made to transfer Kenneth Smith to Project 6-D, to take charge of the southeast district, leaving the project leader more time to coordinate the program over the entire state.

All personnel assisted from time to time in the nursery work and in various other activities, such as teaching courses at 4-H camps, etc.

The number of seedlings secured from the nursery this first season was far less than anticipated. This seemed to be due to a number of things—a considerable number of plants were lost by "damping off," some losses occurred during irrigation and cultivation, and after the heavy frosts had reduced the amount of available food, the rabbits invaded the nursery in great numbers, clipping the bicolor stems down to the ground. (The entire area of the former air base is public property and posted, so there is no check on the rabbit population by hunters.) One portion of the field also seemed to be rather heavily infested with nematodes. On the 10 acre plot, of which approximately 8 acres were actually planted in bicolor, only 533,000 seedlings were secured, this being only about one-third of the estimate made during the summer. However, the plants were of much better quality than those secured from Georgia. The cost per thousand was only $2.82. Requests for over one million seedlings were received and the material available had to be allocated to the various parishes on an equitable basis. The opportunity to purchase additional plants did not occur until the later part of March, which is too late for the farmers in Louisiana. It was deemed advisable to make out with the plants grown in our own nursery even if it was only about two-thirds of the number planned for.

The breakdown for 1951 planting season was as follows:

Agricultural Extension Service put out 289 borders in 35 parishes and the S.C.S. put out 383 field borders in 31 work

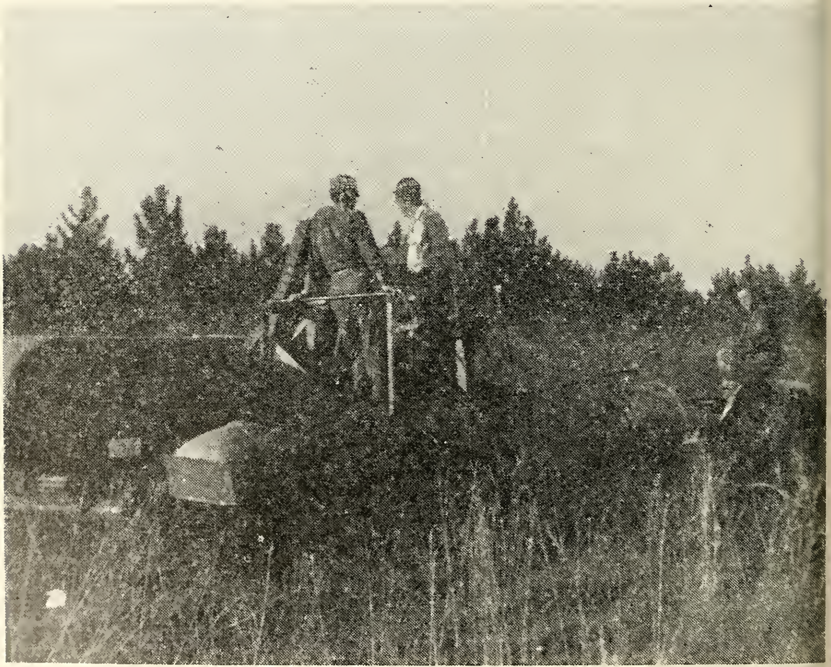


FIGURE 9—Assistant project leaders and nursery foreman harvesting lespedeza bicolor seed on the seed reproduction plot located on the Caney Lake Land Utilization Project of the Soil Conservation Service.

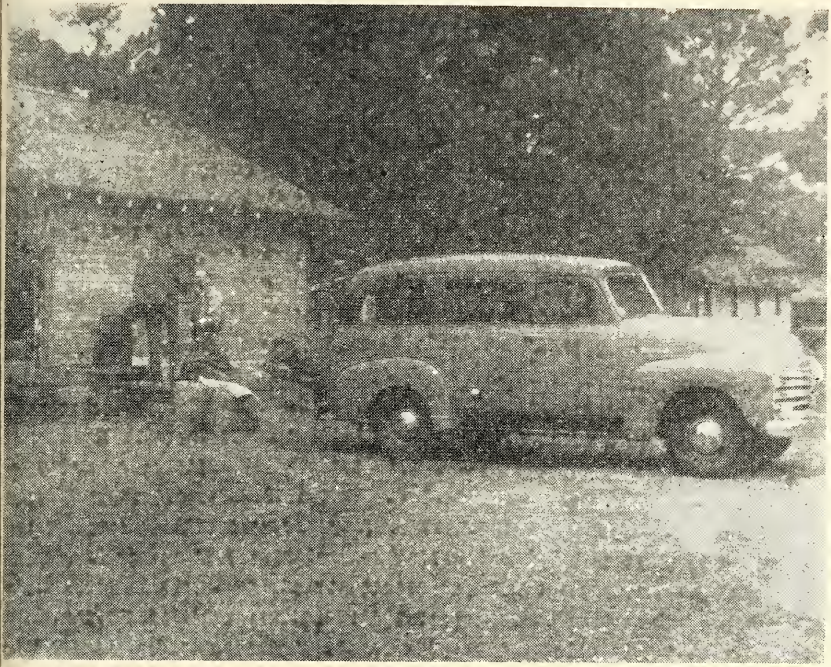


FIGURE 10—Assistant project leader and project leader using hammermill to hull lespedeza bicolor seed at the Soil Conservation Service nursery headquarters at Minden.

units. Some of these were established with bicolor seed. (One field border consists of 1,000 bicolor seedlings, plus 5 pounds of sericea seed or 1 pound bicolor seed to 5 of sericea.)

A considerable amount of work is being done with the 4-H clubs over the state and some work commenced with the veterans' on-the-farm training classes.

The reorganization of the Soil Conservation Service added approximately twenty new offices and necessitated considerable work to familiarize the new S.C.S. personnel with our farm game habitat improvement program and to line up the cooperators for the following planting season.

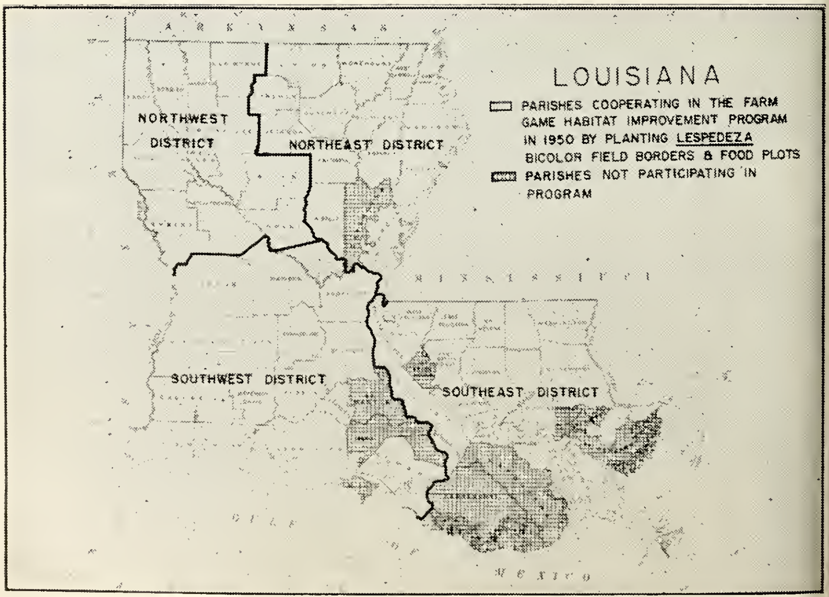
The portion of the bicolor nursery used in actual seedling production was approximately doubled and the assistant project eader, Jack Sims, was kept busy with this phase of the work, with the assistance of Louie Hickman as nursery foreman and/or tractor operator.

All personnel of Project 6-D also assisted the other projects in various ways, such as cooperating in road counts for doves and in making waterfowl bag checks, etc.

Continued emphasis was placed on work with groups, such as the 4-H clubs and the vocational agriculture students. These young people will be operating most of the farms in the state in a few years and it is necessary that they be trained in wildlife conservation at the same time that they are learning other farming practices if we expect to have a farm game crop to harvest in the future.

The seed reproduction plot at Minden was harvested by combine but the severe drought had caused seed production to be extremely light and additional seed of an improved strain was secured from Carolina to supplement our supply.

It was necessary to lift the bicolor seedlings during the Thanksgiving holidays so that the high-school boys would be available to pull and bundle the seedlings. A considerable number of plants were left in the field and most of the production of two areas was lost due to root rot but one million and four thousand seedlings were lifted, counted, bundled and heeled-in


ARKANSAS
LOUISIANA
▭ PARISHES COOPERATING IN THE FARM GAME HABITAT IMPROVEMENT PROGRAM IN 1950 BY PLANTING LESPEDEZA BICOLOR FIELD BORDERS & FOOD PLOTS
▨ PARISHES NOT PARTICIPATING IN PROGRAM
NORTHWEST DISTRICT
NORTHEAST DISTRICT
MISSISSIPPI
SOUTHWEST DISTRICT
SOUTHEAST DISTRICT
GULF
MEXICO

during the month of November. Due to his impending resignation Assistant Leader Futch was forced to make his deliveries in December, but the rest of the material was held until the following January. Futch delivered 90,000 seedlings to seven S.C.S. work units and 136,000 seedlings to six Agricultural Extension offices. (The project leader made more deliveries in this area later.) Futch turned in his resignation effective January 15th and Darsey announced that he would resign on February 15th, both to take positions as foresters.

The plants grown on the nursery in 1951 were of superior size and quality and many were in bloom when the early frost struck. The larger plants require more labor in harvesting and in planting but show much better survival and are able to establish a good root system before the summer dry weather sets in.

There is no quick and easy method of game restoration, but the farm game habitat improvement program in Louisiana has shown that when properly located, established and protected these combination bicolor-sericea field borders are used by quail, both for nesting cover in the summer and for food in late winter and early spring, and the farm operator who is willing to put forth the effort can increase the carrying capacity of his farm for game, and will find that he has a harvestable surplus each year while still carrying over sufficient birds to maintain the population.

PROJECT 14-D, DEER TRAPPING AND TRANSPLANTING; LAND ACQUISITION; AND PURCHASE OF GAME FOR RESTOCKING

Introduction

Project 14-D, carried out from 1948 to 1951, consisted of three phases: (1) the trapping of deer in various parts of the state and the transplanting of them on suitable areas, (2) the examination, acquisition by lease or agreement and the setting up of various refuges over the state, and (3) the purchase of deer and turkey for restocking on refuges. These three sections of the project are distinct from each other and will be discussed separately.

The trapping and transplanting of deer has been successfully used by many states in managing their deer herds, but it takes a considerable amount of experience and hard work to make it a success. Texas and Arkansas have been unusually successful with this method of repopulating deer range. In most cases, deer were trapped on overpopulated or heavily populated areas and moved to areas where the breeding population was sparse or absent. Their with good protection and time enough to breed, it was not many years before new areas could be opened to shooting.

The history of the deer-trapping effort in Louisiana goes back three years to the beginning of Federal-Aid Project 14-D in 1948. This project, under the leadership of C. J. Perkins, now supervisor of all Federal-Aid development projects, and F. D.

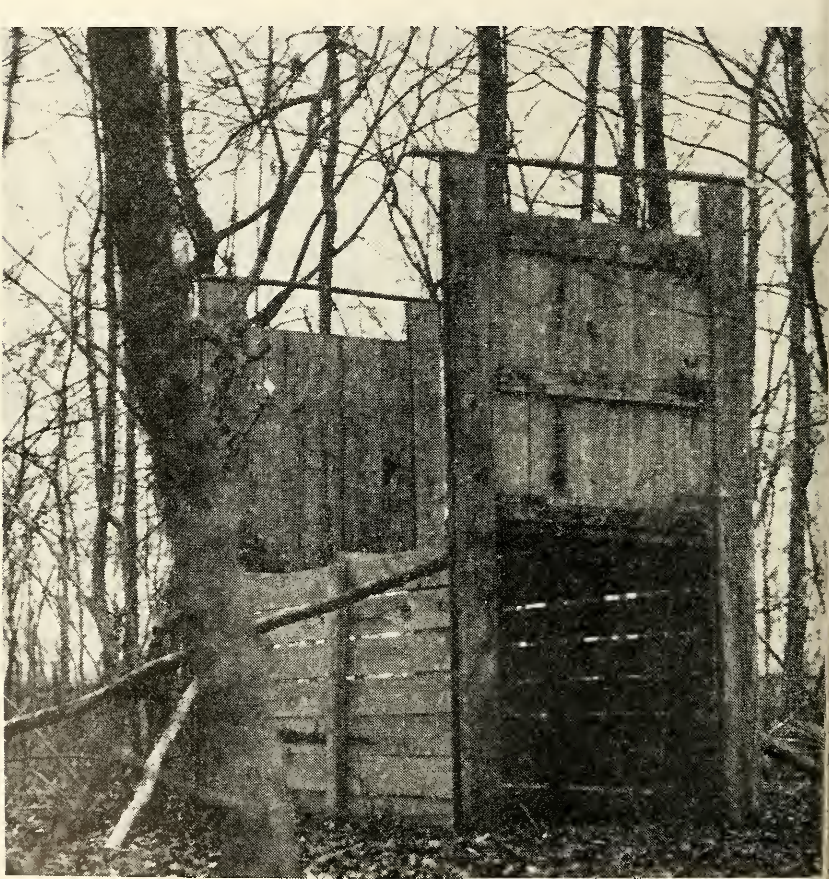


FIGURE 1—Typical box-type deer trap set in a good locality. Th drop-type doors are held up by wires which become loose and allow th doors to fall when the trigger is sprung. Bait is placed inside the trap t attract deer.

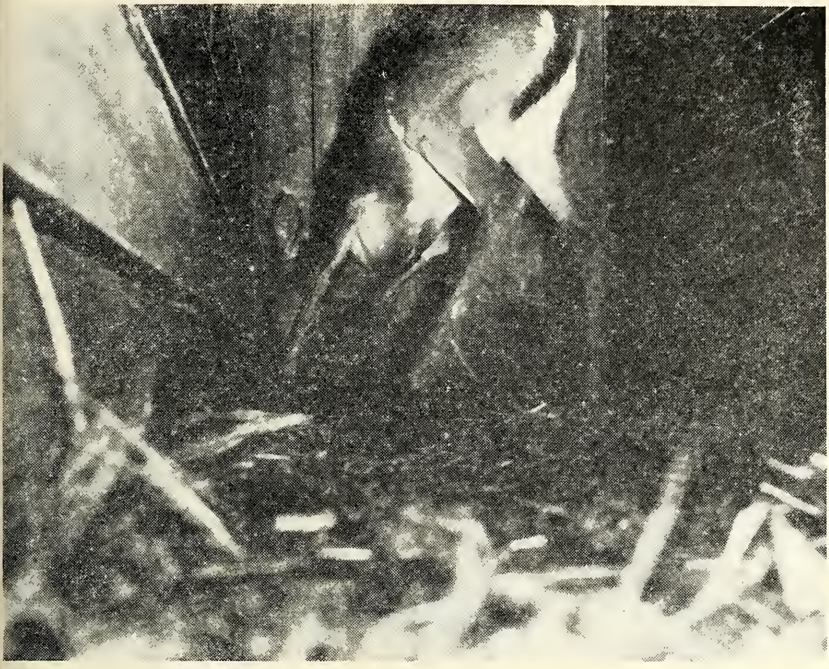


FIGURE 2—The trap is constructed so as to prevent injury to the deer.

Hollis, field biologist, trapped deer on the estate of Mr. Glenn Shadow, near Ruston, Louisiana. This private estate, surrounded by a deerproof fence, had become overpopulated with deer and it became necessary for Mr. Shadow to remove some of them. This trapping effort proved so successful that the project was then extended to trapping on Marsh Island, a state refuge; to Chico Park, another state refuge; and to Zemurray Park and Frost Park, two private estates near Hammond and Shreveport, respectively. As trapping was extended, Mr. Hollis assumed leadership of the project with Biologist Kenneth Smith as assistant. Perkins became supervisor of all development, including deer trapping. Since July 1, 1951, all deer trapping has been included as part of Federal-Aid Project 23-D under the supervision of Mr. Perkins with either Biologists Rowland Vernon or F. D. Hollis in charge of the actual trapping.

In the earlier trapping efforts, much experience was gained by the biologist regarding trap types, bait, and methods of banding deer. One thing, however, became all too apparent and that

TABLE I—A SUMMARY OF DEER TRAPPING RESULTS IN LOUISIANA

No.	Type Area	Owner	Total No. Trapped	Bucks	Does	Young	Adult	Release Point
1	300 A pine-hardwood, fenced estate, unhunted	Glenn Shadow	33	14	19	12	21	Caldwell Parish, Allen, Beauregard, Lincoln Parishes
2	Chico Park, state owned. Deer in small enclosure, not hunted	State of Louisiana	20	12	8	11	9	Allen Parish
3	Frost Park, pine-hardwood, 75 a. fenced, not hunted	Frost Industries, Inc.	22	9	13	7	15	Union Parish
4	Avery Island, hardwood area, private	McIlhenny	8	4	4	0	8	Livingston Parish Rapides Parish
5	Marsh Island, 80,000 A mash, waterfowl refuge, not hunted	State of Louisiana	23	8	15	12	11	Livingston Parish Caldwell Parish Rapides Parish
Total on unhunted areas..			106	47	59	42	64	
6	Zemurray Park, pine-hardwood, private, fenced, hunted	Samuel Zemurray	11	4	7	6	5	Livingston Parish
	Madison Parish, bottomland, hunted	J. W. McLemore, Sr. D. H. Allen D. G. Hammond John Olvey, Jr.	53	17*	36*	26	27	Jackson-Bienville Parish
Total on hunted areas..			64	21	43	32	32	
GRAND TOTAL			170	68	102	74	96	

*Bucks ear tagged and released in same area. Does transported to new areas.

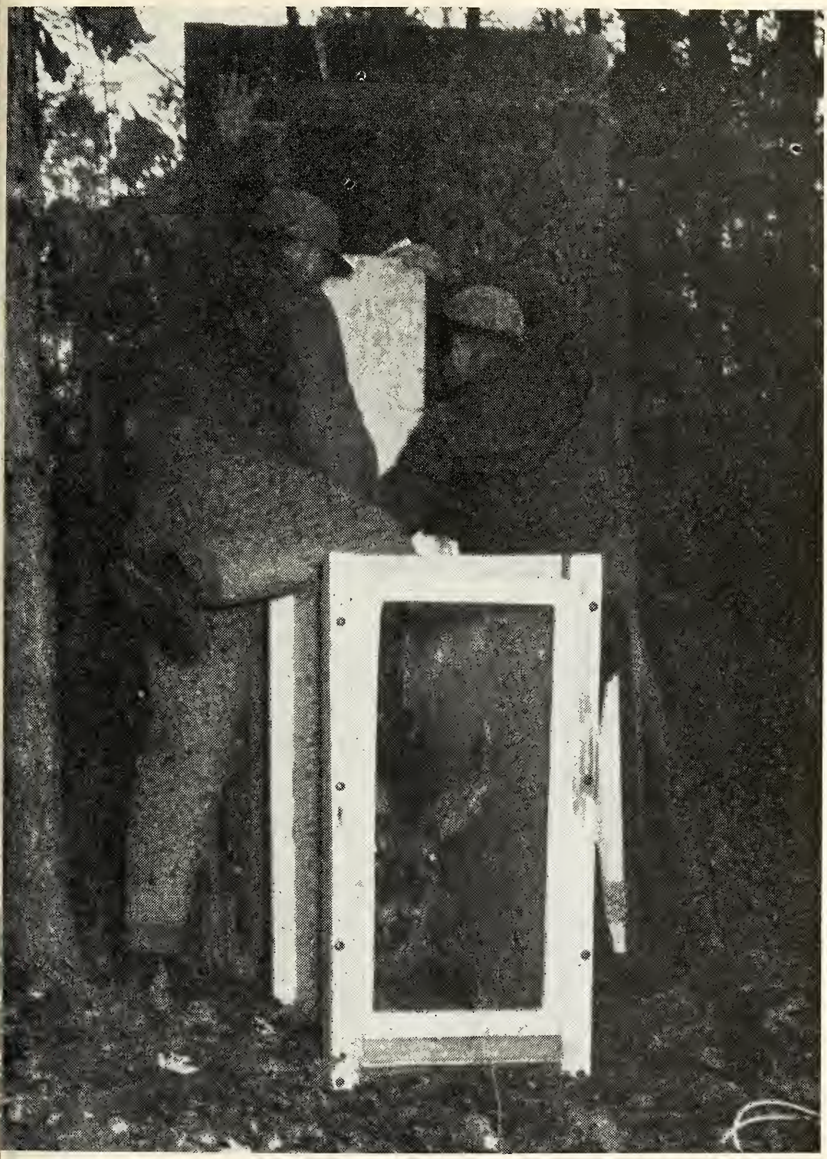


FIGURE 3—The deer is run from the sprung trap into a small plywood loading crate. Only two or three men are needed to handle this operation.

was that even with know-how and hard work few deer would be caught unless the population was high, food scarce, and a relatively large area was available for trapping. With this in mind, Commissioner Clements and Major Brown were able to obtain the excellent cooperation from several private landowners in Madison Parish who have allowed the Department to set up trapping operations on their heavily stocked lands. Since these lands are in an area where hunting occurs during open season, only does are being transported to new areas while all bucks caught are tagged and released. Trapping was begun in Madison Parish on February 8, 1952, and proved immediately successful. In only seven trap-nights more than fifty deer were taken which represents nearly 30 per cent of the total catch since the start of the project. This clearly indicates two points: (1) Deer can be caught in considerable numbers where populations are high. (2) Madison Parish has an exceptionally large deer population.

The results of deer trapping in Louisiana is summarized in Table I. From the table, it may be determined the total number of deer trapped, the buck-doe and young-old ratios and the points of release. The data has been divided into that collected in unhunted as opposed to hunted areas. Although there is not suffi-

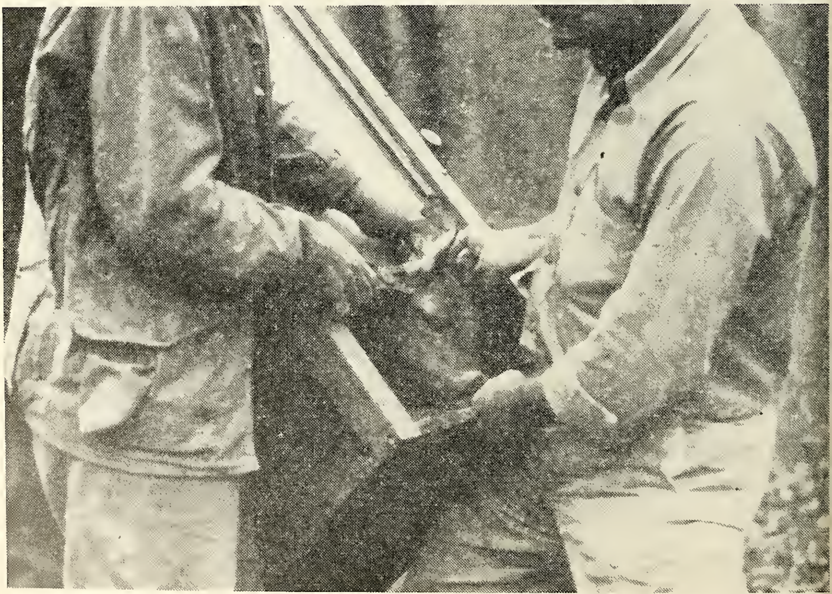


FIGURE 4—Ear tagging each catch is the third step in trapping. This is accomplished by pulling the deer's head under the sliding end of the crate. Skinned knuckles and scratched hands may occur during this part of the operation since this and dehorning are the only times that the deer is touched by the trapper during the entire operation.

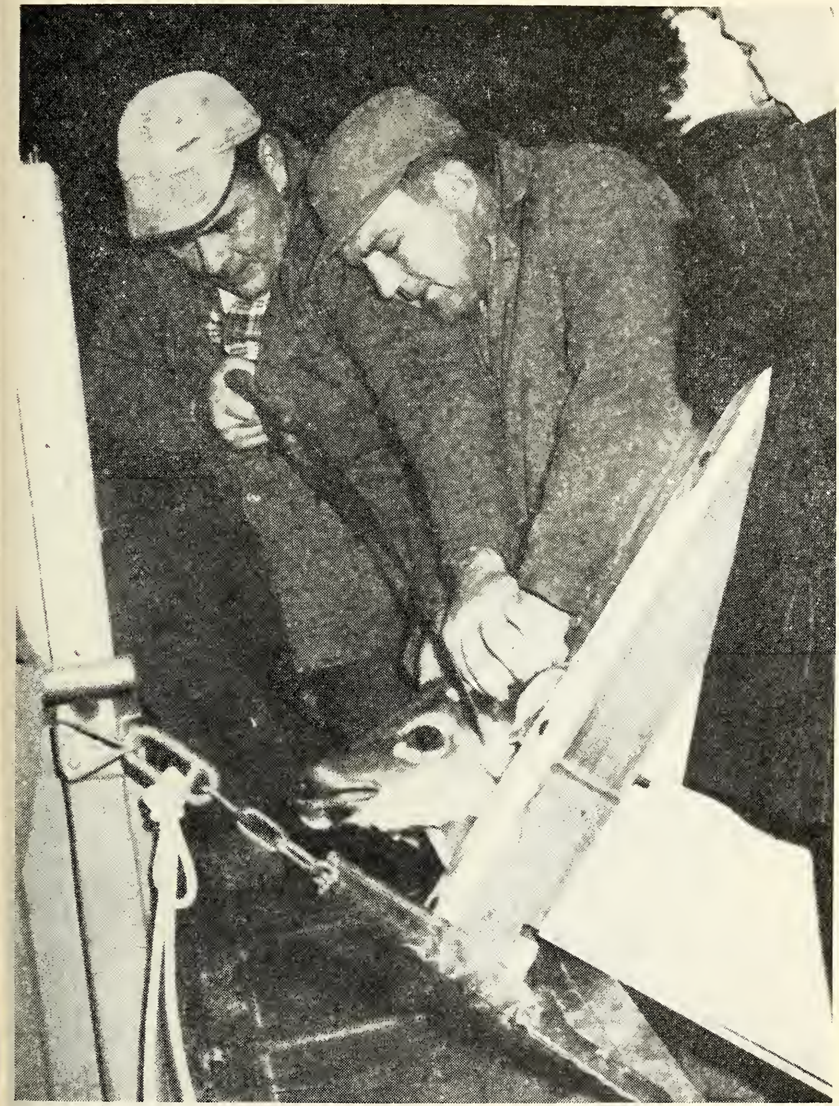


FIGURE 5—Antlers are removed to prevent injury to other deer.

cient data presented here to be reliable, it is interesting to note that approximately twice as many does as bucks were caught in hunted areas, while approximately the same number of each were caught in unhunted areas. This would tend to indicate that in unhunted deer herds the buck-doe ratio is 1:1 while in hunted herds, exposed to a selective killing of bucks, the ratio is distorted with does being in the majority by 2 or 3 to 1. It may also be significant that the young-old ratio is different in hunted and unhunted areas.

Of considerable public interest is the method used to trap deer. Photographs 1 through 9 show better than words the various steps in trapping and handling deer.

The bait used varies from area to area and must be determined by trial and error. Different baits used include apples, corn, soya beans, cottonseed meal cakes and salt. Deer handled as depicted here are not dangerous to the trapper. Except for scratched and skinned hands collected during the tagging process, there is no damage done to the handlers because the deer are never touched.

In conclusion, it is of importance that the value of the trapping program be examined. Since deer are relatively slow breeding animals, any deer management program for Louisiana must be designed to continue over a period of ten or more years in order that herds can be established and given time to reach shootable proportions before the season is opened. On the other

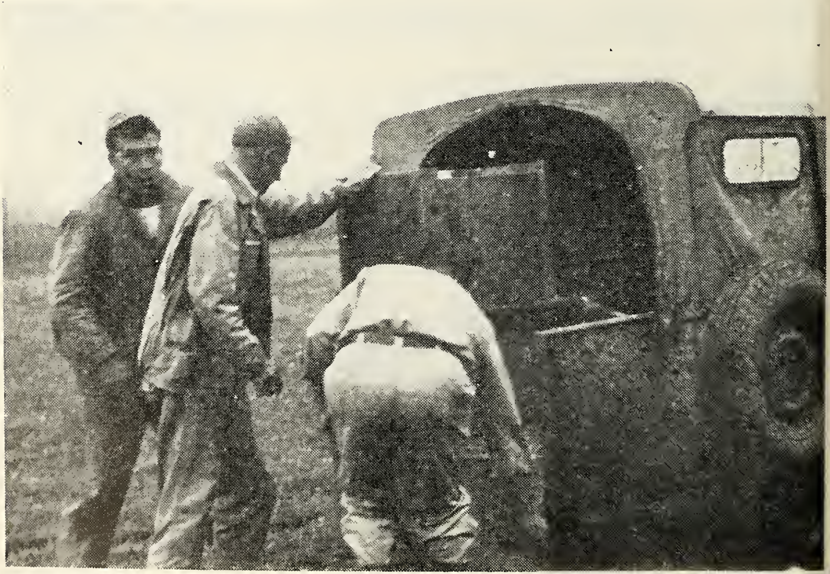


FIGURE 6—The carrying crate is loaded on a jeep for transfer to a truck on a nearby highway.

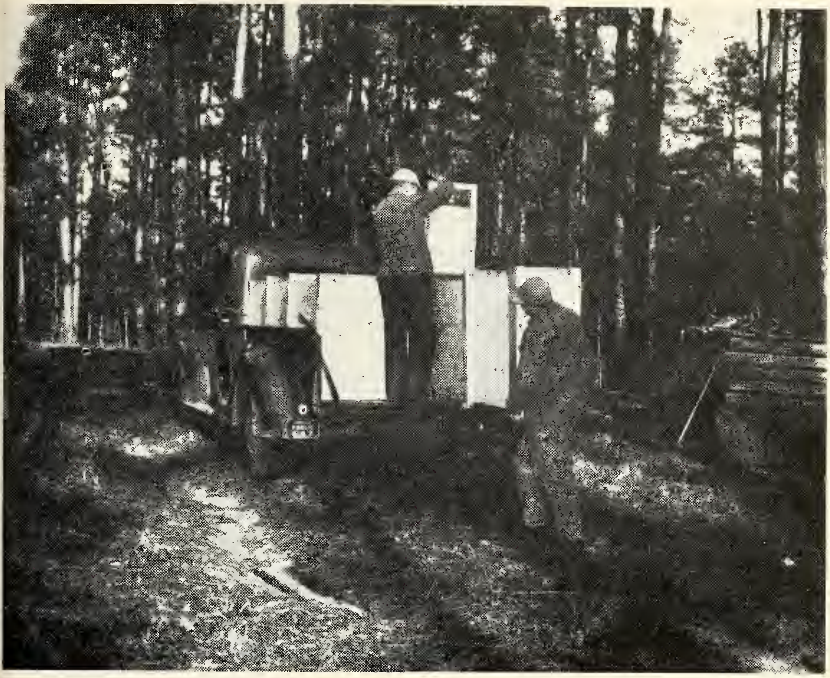


FIGURE 7—The deer runs from the carrying crate into a closed hay-filled box on the back of a large truck. In this manner, deer are safely transported to the various refuges and release sites over the state.

hand, once a deer population becomes high, the rate of increase, although relatively slow, has a pyramiding effect and the growth of the population is soon faster than the annual harvest can counterbalance. When this occurs, overpopulation, with starvation, crop damage, and a loss or great reduction in the size of the deer herd, is likely to occur. Good game management attempts to anticipate such conditions and to rectify such by trapping or other means of relieving the strain of overpopulation.

A recent survey of deer conditions in Louisiana carried out on Pittman-Robertson Project 8-R indicates certain parts of Louisiana deer range to be heavily populated and possibly approaching overpopulation while many thousands of acres of range in the State are in need of an increase in breeding stock. Overpopulated areas should be trapped; they are a source of deer to stock unpopulated range.

Because of these findings, the present trapping program along with the purchase of deer from other states was inaugurated in order to build up herds in sparsely populated areas. Trapping does in heavily populated areas, like Madison Parish, has many advantages for the local landowners and hunters, the Department of Wild Life and Fisheries and the hunters in other areas of the state. These may be enumerated as follows:

1. Trapping in heavily populated areas reduces the extent of overpopulation and helps to delay if not prevent overbrowsing.

2. Removal of deer from such areas decreases crop damage.

3. Removal of doe deer from areas where only bucks are hunted gives a better buck-doe ratio and makes hunting better.

4. The formation of new herds with these trapped deer at widely scattered sites over the state reduces outside hunting pressure on any one area and gives a better distribution of game for all hunters.

5. Deer trapping on heavily populated areas in Louisiana is the most economical means of securing deer for new herds.

FIGURE 8—The deer lie down immediately upon entering the carrying box on the pickup truck.

FIGURE 9—A group of interested sportsmen and landowners stop to talk about the trapping project and to observe the trapping procedure.

6. Possibly more deer can be trapped than are available for purchase, provided trapping can be continued on heavily populated areas.

Refuge Establishment

Acquiring lands for game management purposes was always an integral part of Project 14-D. Due to the present inflated values of land in Louisiana, the state has not been able to purchase lands for this purpose. Hence, most game management work is carried out on privately owned lands which the state leases, without fee, for game management purposes. During the lifetime of the project, eight game management areas, which are called refuges by local citizens, were established in ten parishes. Investigations were made on twenty-one other separate areas which, for one reason or another, were not set up as game management areas. A report was submitted on each of these twenty-one areas.

Major Steps in Refuge Establishment

The major steps in setting up a refuge for game management purposes under FA Project 14-D may be summarized as follows:

1. Inspection of an area by a game technician upon the request of a local organization which sponsors the area.
2. Report of game technician on game potentialities of the area to Commissioner of Department of Wild Life and Fisheries and to the regional office of U.S. Fish and Wildlife Service.
3. Approval of area by the Commissioner and the regional office.
4. Acquiring leases on approved area by local sponsors for a period of 10 to 20 years without fee.
5. Recording leases with proper authorities in the respective parishes.
6. Publishing proclamation by the Governor of Louisiana and order of the Commissioner of the Department of Wild Life and Fisheries setting aside the area as a refuge.
7. Marking and posting the boundaries of the area.

The investigation of a proposed or pending area was carried out by a game technician who took into consideration all of the game potentialities of the area. Not only was the location and type of vegetation on the area considered, but the surrounding lands as well. The sentiment of local citizens who live adjacent to the area was considered very important. The nature of the land, type of soil, drainage, water courses, land usage and agricultural development around the area were all considered important. When the game technician had inspected the area to his satisfaction, as well as the satisfaction of the local sponsors, he submitted a brief but comprehensive report. This report is very objective in appraising the value of the area as a game management site.

Under this mode of operation, twenty-one separate areas were investigated and reports submitted in the following parishes: Beauregard, Calcasieu, Caldwell, Claiborne, Concordia, DeSoto, Grant, LaSalle, Morehouse, Ouachita, Sabine, St. James, St. Landry, St. Tammany, Union and Washington. For various reasons, none of the above areas have been completely processed to date.

Refuges Established

In addition to the above areas, investigations were conducted on eight other areas, on private lands, which were set up as refuges. Leases were without fee for periods ranging from 10 to 20 years. These eight areas and the parishes in which they are located in the order of their establishment are as follows:

1. West Bay Game Management Area in Allen Parish.
2. Livingston Parish Game Management Area in Livingston Parish.
3. Union Parish Game Management Area in Union Parish.
4. Caldwell Parish Game Management Area in Caldwell Parish.
5. Sabine Parish Game Management Area in Sabine Parish.
6. Zemurray Park Game Management Area in Tangipahoa Parish.
7. Jackson-Bienville Game Management Area in the parishes of Jackson and Bienville.
8. Grant-Rapides Game Management Area in the parishes of Grant and Rapides.

Until July 1, 1950, surveying out lines where necessary, brushing out the boundary lines and painting and posting the boundaries were done by personnel of FA Project 14-D. After this date, the boundaries were established and marked by personnel of FA Project 23-D, "Development of Wildlife Management Areas." Development of the game resources and management of game on the areas has always been carried out by other FA projects.

Six of the above refuges are in the pine-hardwood forest lands of the state, and the other two are bottomland hardwood areas. The size of these areas varies from 5,000 acres in Zemurray Park to 18,600 acres in West Bay. Species of game to benefit from these management areas are deer, turkey, and

TABLE VIII: A Summary Concerning Location, Size, Land Ownership, Forest Cover Types, and Species to be Benefited of the Various Game Management Areas Established Under Project 14-D.

Name of Area	Location (Parish)	Acreage (approx.)	Primary Forest Cover Types	Land Ownership	Species to Be Benefited
West Bay Game Management Area............	Allen	18,600	Pine-hardwoods	Private	Deer, turkey, squirrel
Livingston Parish Game Management Area.....	Livingston	10,000	Pine-hardwoods: bottomland hardwoods	Private	Deer, turkey, squirrel
Union Parish Game Management Area............	Union	10,000	Pine-hardwoods	Private	Deer, turkey, squirrel
Caldwell Parish Game Management Area......	Caldwell	10,000	Bottomland hardwoods	Private	Deer, turkey, squirrel
Sabine Parish Game Management Area...........	Sabine	8,000	Pine-hardwoods	Private	Deer, turkey, squirrel
Grant-Rapides Game Management Area............	Grant and Rapides	7,700	Bottomland hardwoods	Private	Deer, turkey, squirrel
Jackson-Bienville Game Management Area......	Jackson and Bienville	15,500	Pine-hardwoods	Private	Deer, turkey, squirrel
Zemurray Park Game Management Area.....	Tangipahoa	5,000	Pine-hardwoods	Private	Deer

squirrel, on all of them except Zemurray Park where only deer will be managed. (For details concerning size, cover type, species to be benefited and location see Table VIII.)

Purchase of Game for Restocking Purposes

Since most of the game management areas on privately owned lands did not possess adequate breeding potentials of deer and turkey, the Wild Life and Fisheries Department began the purchase of deer and turkey for releasing on these areas. During the fiscal year ending July 1, 1950, funds were provided for in FA Project 14-D for the purchase of approximately 300 turkey and 200 deer. Turkeys to be used were game farm birds, and this phase of the project was set up on a more or less experimental basis.

Turkey Purchases and Releases

As pointed out above, none of the game management areas had an adequate breeding potential of wild turkey. In order to establish flocks on these areas, which were considered good turkey habitat, restocking was carried out with birds purchased from game farms. During the fiscal year ending July 1, 1950, all birds used for restocking Federal-Aid game management areas in the state were purchased by FA Project 14-D. At this time there were only seven game management areas in the state—four on privately owned lands and three on U.S. Forest Service lands. A total of 306 birds were purchased for $5,032.00. Additional expenses connected with crating, shipping and feeding the birds brought the total cost to $6,151.66. (For information relative to the source, cost and distribution of these birds, see Tables IX and X.) Conditioning pens were built, and the birds were held in these pens until they got over the effects of shipping.

The responsibility of Project 14-D ended with the release of the birds on the individual game management areas. The job of managing the birds after release was the responsibility of personnel working on other Federal-Aid projects.

TABLE IX: SOURCE AND COST OF TURKEYS RELEASED ON PITTMAN-ROBERTSON PROJECTS UNDER PROJECT 14-D.

Date of Release	Source of Birds	No. Birds Released	Initial Cost of Birds	Cost of Crating & Shipping	Total Cost of Conditioning (Pens, etc.)	Total Cost of Feeding	Total Cost of Birds
9/17/49	Anna Smith, Pa.	161	$1,932.00	$271.90			$2,203.90
11/11/49	Woodmont Rod & Gun Club, Berkeley Springs, West Va.	80	2,000.00	198.70			2,198.70
11/16/49	Anna Smith, Pa.	25	250.00	25.25			275.25
12/ 7/49	Tom Bigby, Ala.	40	850.00				850.00
Total		306	$5,032.00	$495.85	$492.40	$131.41	
Grand Total Cost of Birds Released on Pittman-Robertson Projects..							$6,151.66

TABLE X: DISTRIBUTION OF TURKEYS PURCHASED ON PROJECT 14-D TO THE VARIOUS REFUGES IN LOUISIANA.

	Number of Birds Released on Various Dates				
Refuge	9/17/49*	11/11/49†	11/16/49*	12/7/49‡	Total
Caldwell	0	21	0	10	31
Catahoula	24	9	0	0	33
Evangeline	24	9	0	0	33
Livingston	18	14	0	10	42
Red Dirt	35	7	0	10	52
Union	24	0	25	0	49
West Bay	36	20	0	10	66
Totals	161	80	25	40	306

* Shipped from Anna Smith, Pennsylvania.

† Shipped from Woodmont Rod and Gun Club, Woodmont, West Virginia.

‡ Shipped from Tom Bigby Refuge, Montgomery, Alabama.

TABLE XI: Distribution, Source and Cost of All Deer Purchased by Project 14-D.

Release Area	Total Deer Released on Each Area	No. From Each Source	Source of Deer	Cost Per Deer	Total Cost From Each Source
West Bay Game Management Area	48	48	Aransas National Refuge—Texas	$ 23.39	$ 1,122.72
Catahoula National Wildlife Refuge	13	13	Aransas National Refuge—Texas	23.39	304.07
Sabine Parish Game Management Area	29	29	Aransas National Refuge—Texas	23.39	678.31
Grant-Rapides Game Management Area	10	10	Aransas National Refuge—Texas	23.39	233.90
Caldwell Parish Game Management Area	42	42	Schowalter Game Farm, Wisconsin	6 @110.00 36 @125.00	660.00 4,500.00
Evangeline National Wildlife Refuge	32	19	Sandhill Game Farm, Wisconsin	125.00	2,375.00
		13	Schowalter Game Farm, Wisconsin	125.00	1,625.00
Livingston Parish Game Management Area	19	19	Sandhill Game Farm, Wisconsin	125.00	2,375.00
Union Parish Game Management Area	15	15	Schowalter Game Farm, Wisconsin	125.00	1,875.00
TOTALS	208	208			$15,749.00

Aransas National Refuge.............50 per cent bucks; 50 per cent does
Schowalter Game Farm..............42 per cent bucks; 58 per cent does
Sandhill Game Farm...............48 per cent bucks; 52 per cent does

After July 1, 1950, turkeys purchased and released on Federal-Aid game management areas were administered by FA Project 23-D.

Purchase and Release of Deer

To supplement the deer being trapped and to accelerate the deer restocking program on FA game management areas, the Department of Wild Life and Fisheries purchased 208 deer during the fiscal year ending June 30, 1951, with funds provided for by Project 14-D. One hundred deer were purchased from Aransas National Refuge for an average cost of $23.39 each, which approximated the actual cost of trapping. The remaining 108 deer were purchased from game farms in Wisconsin at an average cost of $118.05. The total cost of all deer purchased by FA Project 14-D was $15,749.00.

The 208 deer purchased by FA Project 14-D were used for restocking Federal-Aid game management areas which did not have adequate breeding potential. After release, the management of these deer became the responsibility of Federal-Aid Project 23-D, "Development of Wildlife Management Areas." For details relative to source, cost and distribution of deer purchased for restocking game management areas consult Table XI.

PROJECT 23-D, DEVELOPMENT OF WILDLIFE MANAGEMENT AREAS

Introduction

This is a report of the work done on Project 23-D, "Development of Wildlife Management Areas," for the period January 1, 1950, through December 31, 1951.

This project is the land development phase of the Federal-Aid in wildlife restoration program in Louisiana. Under this phase of the program certain specific areas located throughout the state are under lease or contract for the purpose of developing all game resources to a maximum.

On July 1, 1950, Project 23-D was inaugurated to consolidate the development work on all game management areas and to make more efficient use of personnel and equipment.

There are at present eleven game management areas comprising a total of approximately 180,000 acres. These are located throughout the state on private and U.S. Forest Service lands.

Chart No. 1

GAME MANAGEMENT AREAS

Name	Location (Parish)	Acreage (approx.)	Ownership	Species to Be Benefited
Red Dirt	Natchitoches	40,000	U.S.F.S.	Deer, quail, turkey
Catahoula	Winn & Grant	40,000	U.S.F.S.	Deer, turkey, squirrel
Evangeline	Rapides	15,000	U.S.F.S.	Deer, quail
West Bay	Allen	18,600	Private	Deer, turkey, squirrel
Livingston	Livingston	10,000	Private	Deer, turkey, squirrel
Caldwell	Caldwell	10,000	Private	Deer, turkey, squirrel
Union	Union	10,000	Private	Deer, turkey, squirrel
Sabine	Sabine	8,000	Private	Deer, turkey, squirrel
Grant-Rapides	Grant-Rapides	7,700	Private	Deer, turkey, squirrel
Jackson-Bienville	Jackson-Bienville	15,500	Private	Deer, turkey, squirrel
Zemurray Park	Tangipahoa	5,000	Private	Deer

The development work on each game management area is carried out by the refuge manager under the supervision of the game technician following a work program outlined at the beginning of each fiscal year.

In general, the work program for each game management area includes the following types of work:

1. Establishing and maintaining boundaries.
2. Constructing and maintaining fences.
3. Constructing and repairing roads and bridges.
4. Plowing fire lines and control burning.
5. Planting supplemental food and cover for game.
6. Assisting in predator control.
7. Releasing game when necessary.
8. Making experimental food and cover plantings.
9. Censusing and indexing game populations.
10. Patroling.

Other phases of Project 23-D included the investigation of proposed game management areas and the trapping of deer for transplanting on management areas.

A summary of the development work done on each game management area is as follows:

RED DIRT GAME MANAGEMENT AREA

C. E. Harrison, Game Technician; H. C. Beasley, Refuge Manager

The Red Dirt Game Management Area, approximately 40,000 acres in size, is located on U.S. Forest Service lands in the south-central portion of Natchitoches Parish.

The area contains a variety of timber types, including stands of pure pine, mixed pine and hardwood, and bottomland hardwood. Tree sizes vary from seedlings in the grass stage to mature stands of timber. The topography varies from gently rolling hills to rugged outcrops of sandstone of unusual scenic beauty.

Excellent water, food, and cover are available for wildlife along the numerous spring-fed streams interspersed throughout the area.

Intensive forestry management practices have been carried out on this area for a number of years by personnel of the U.S. Forest Service. The results of this work furnish an excellent example of proper forest management.

The success of this game management program, since its inauguration in February, 1948, demonstrates the practicability of a cooperative forestry and game management program.

Deer

The number of deer on this area has shown a sizable increase during the past two years. When this project was inaugurated four years ago, deer were rarely observed; now deer are observed daily by project personnel. Game technicians estimate that there are 500 deer on this area at present. Habitat studies indicate that the area will support a population of 1,000 to 1,200 deer. Observations and deer signs within a four-mile radius of the boundary indicate a natural expansion of the deer herd's range.

Turkeys

A total of 109 game farm turkeys have been released on the Red Dirt area. Despite supplemental turkey food plantings, self-feeders, and predator control work, the propagation of these birds has met with little success. At present there are two flocks of turkeys, with a total of approximately 25 birds, known to be on the area. Intensive investigations failed to reveal any definite cause as to why these birds had such a poor rate of survival.

Quail

The preliminary investigation showed approximately 30 per cent of the area (or 13,000 acres) was suitable for quail propagation work. Since this area contained suitable cover along the numerous spring-fed streams, the quail propagation work consisted primarily of planting supplemental quail food.

These plantings were made on prepared strips 10 to 20 feet wide of various lengths following the natural contours. Reasons for making the plantings in this manner are as follows:

1. To prevent erosion.
2. Strips may be plowed through timbered areas where it is impractical to use plots.
3. Strips are used by quail for travel lanes.
4. Plantings made on strips affect a much wider area than plantings made on plots.

A total of 173 acres of supplemental quail food have been planted. These plantings consisted of common lespedeza bicolor, lespedeza sericea, native partridge pea, and goatweed.

In general these plantings were successful and observations show that the strips are used extensively by quail.

The original census showed the quail population on the Red Dirt area to be approximately one bird per 35 acres. At present the quail population is approximately one bird per 10 to 12 acres.

CATAHOULA GAME MANAGEMENT AREA

Rowland Vernon, Game Technician; Volmer Bowen, Refuge Manager

The Catahoula Game Management Area is located on U.S. Forest Service lands in Winn and Grant Parishes. It comprises an area of approximately 40,000 acres and contains a mixture of second growth longleaf, loblolly, and shortleaf pines and hardwood. The topography varies from gently rolling hills to poorly drained flats with very few streams on the area.

This area affords excellent deer and turkey range.

Deer

The native deer population on this game management area is increasing rapidly. A reported 135 to 150 legal bucks are taken annually within a one-mile radius of the boundary during the hunting season. It has been found that areas of this type will support a population of one deer to approximately 20 acres. A recent census indicates that the population on Catahoula area is approaching the maximum and it will be necessary to remove a portion of the deer herd.

It is generally thought by sportsmen that as the deer population on any given area reaches its maximum carrying capacity the deer will scatter into surrounding areas in search of food. There is a natural expansion of the deer herd's range as the young deer establish themselves on the perimeter of the original herd's range. However, many cases in the northern and southeastern parts of the United States have proven that deer will stay on an area until the food supply is completely exhausted and then starve to death, although there is an abundant supply of food within a distance of two miles from the boundary.

Under the present deer propagation program all the good deer range in the state should contain deer within a five-year period. It should be fully realized by sportsmen that an overpopulated condition of deer will exist within a 15 to 20 year period, at which time drastic steps will have to be taken to reduce the deer population. This means that does and fawns as well as bucks will have to be harvested.

Turkeys

The Catahoula area contains excellent turkey range. However, there were no wild turkey on the area. A total of 98 game farm turkeys have been released on this area during the past two years. This makes a total of 126 birds that have been released since game management work was begun on this game management area.

Turkey management on Catahoula consists of fencing and excluding livestock from a 3,500-acre tract, clearing and planting eight supplemental turkey food plots of approximately five acres each, construction of two watering ponds on the area, maintaining self-feeders for turkey on the area, and extensive predator control.

The above-mentioned management practices have resulted in fairly good success as a recent census showed a total of at least 100 birds on the area.

Squirrels

The squirrel population on the Catahoula Game Management Area has reached its maximum. The annual increase should be harvested.

EVANGELINE GAME MANAGEMENT AREA

Rowland P. Vernon, Game Technician; Horace Stiles, Refuge Manager

The Evangeline Game Management Area is located on U.S. Forest Service lands in south-central Rapides Parish. It contains 15,000 acres of second-growth longleaf and loblolly pines and mixed pine and hardwood. The topography is gently rolling hills interspersed throughout with spring-fed streams.

In general it affords good deer habitat; however, the environment is somewhat limited for turkey, quail, and squirrel propagation.

This area suffered the loss of its headquarters building by fire during the process of remodeling.

Deer

Since the inauguration of game management work on this area in the spring of 1948, a total of 69 deer have been released.

Apparently a large portion of these deer have remained on the area and it is quite common to see deer and deer signs.

Turkeys

A total of 30 game farm turkeys have been released on this area. These releases met with very poor success so it was thought inadvisable to make any further turkey releases.

Quail

Since this area contains only limited quail range, no quail propagation work has been done.

However, the carrying capacity of the Evangeline Game Management Area has been improved by decreasing of the number of cattle and hogs using the area.

WEST BAY GAME MANAGEMENT AREA

Clyde E. Harrison, Game Technician; Ben R. Bass, Refuge Manager

The West Bay Game Management Area is located in the north-central portion of Allen Parish. It contains approximately 18,600 acres of second-growth loblolly, longleaf, mixed pine and hardwood, and pure hardwood timber.

The area is relatively flat and poorly drained. In general it contains excellent deer and squirrel range and is surrounded by approximately 50,000 acres of similar game habitat.

Through cooperation with private landowners this area has been acquired by the state for game management purposes on a long term lease without fee.

The preliminary investigation showed that the area contained no deer or turkey but a relatively high population of squirrels.

Deer

Since the inauguration of the game management program in May, 1949, a total of 193 deer have been released on the West Bay area.

All reports indicate that these releases have been highly successful and that the deer have become well established.

Turkeys

A total of 413 game farm turkeys have been released on this area. These turkeys have become widely scattered on and around the surrounding area and it is impossible to give an accurate estimate as to the rate of survival at this time.

Turkey management work on this area consisted of clearing, fencing, and planting five food plots of approximately five acres each; intensive predator control; maintenance of self-feeders for turkey; construction of ponds for watering places.

Squirrels

A total of 300 squirrels have been released on the area. A portion of these squirrels were eartagged and marked with dye for scientific study.

There have been several reports of hunters having taken a number of these squirrels around the perimeter of the West Bay area.

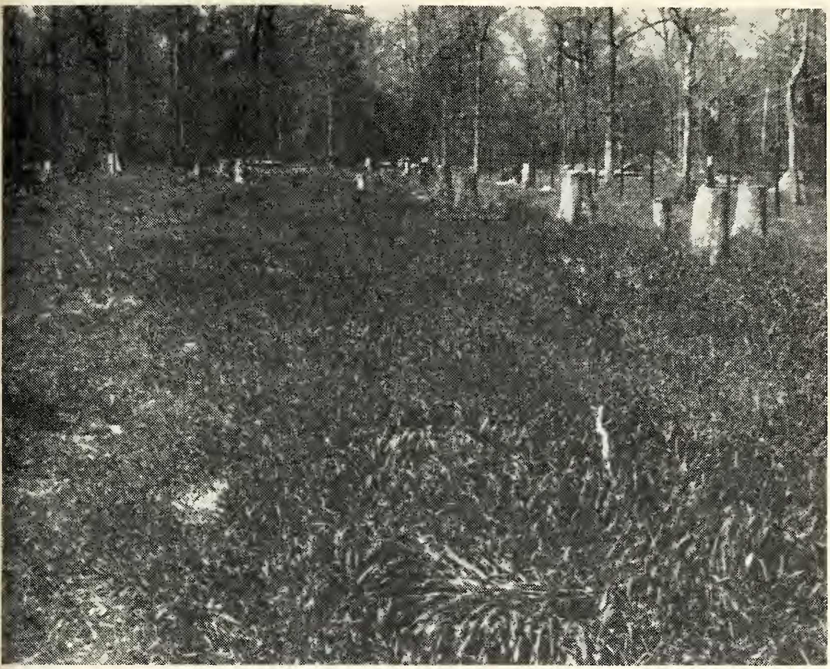


FIGURE 1—Wheat growing on a turkey food plot on a game management area. A total of 157.6 acres of turkey food of this type have been planted in the past two years.

Quail

This area contains a limited amount of potential quail range and very little quail management work has been done.

The pen-raised quail released on this area have met with varying degrees of success.

LIVINGSTON PARISH GAME MANAGEMENT AREA

Flavil D. Hollis, Game Technician; W. B. Smith, Refuge Manager

Livingston Parish Game Management Area is located in the southern portion of Livingston Parish and comprises an area of approximately 10,000 acres. It is relatively flat and poorly drained, containing a dense stand of loblolly pine, mixed hardwood, and swamplands. A number of old, abandoned fields are to be found throughout this area.

The use of this land for wildlife management purposes has been acquired from private landowners by long term lease without fee.

The Livingston area contains excellent deer, turkey, and squirrel range, with an original scattered stocking of deer and turkey.

Deer

Since the inauguration of this game management area in October of 1949, a total of 42 deer have been released.

These releases have been highly satisfactory and deer and deer signs may be observed frequently.

Turkeys

A total of 75 game farm turkeys have been released on this area. These releases have also proven highly satisfactory and the area now contains one of the highest turkey populations to

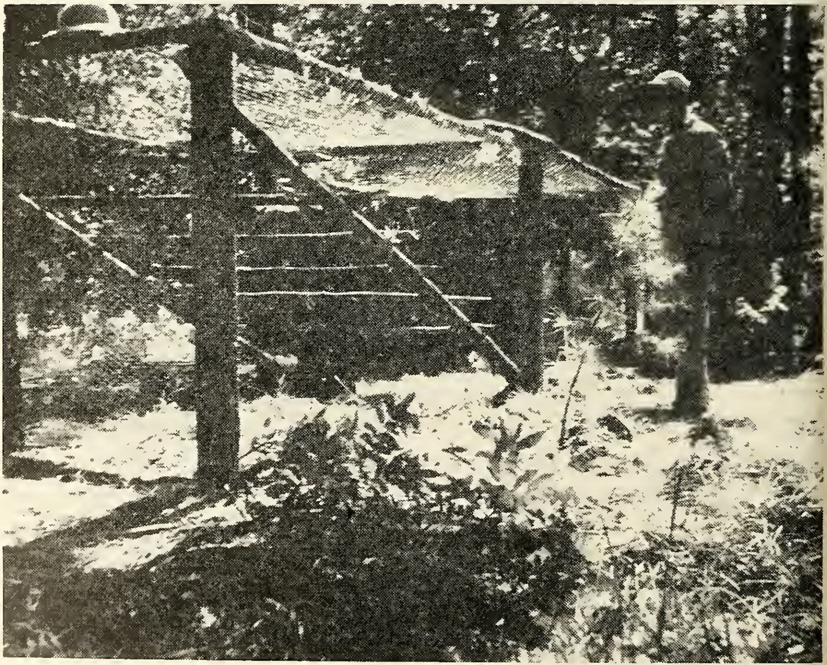


FIGURE 2—A turkey conditioning pen. A total of twenty-three pens such as this were constructed on game management areas. Fifteen to twenty-five game farm turkey were placed in each pen and were released a few at a time over a six- to a eight-week period.

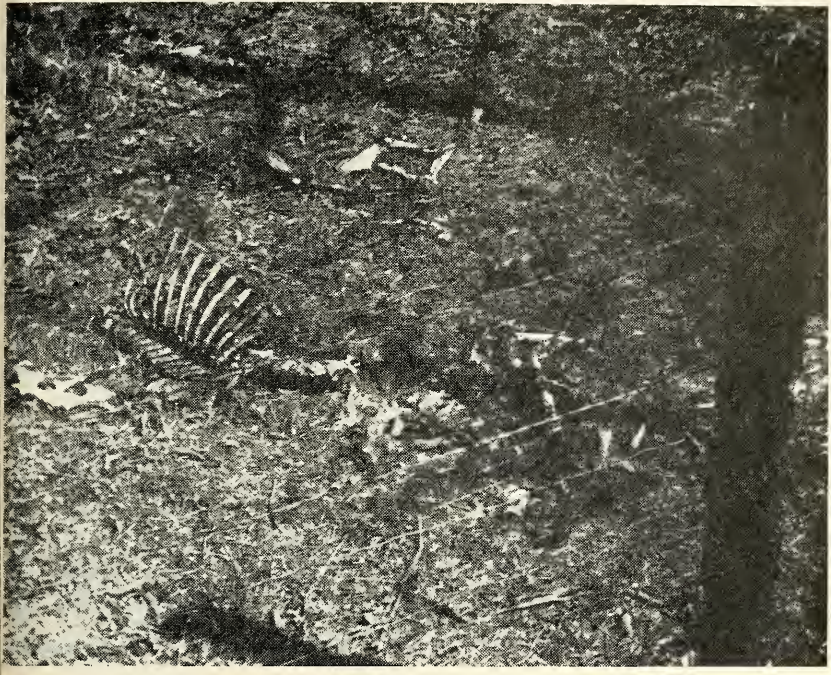


FIGURE 4—Carcass of a deer on the boundary of a game management area. This deer was purchased from Wisconsin at a cost of $125 and released on this area. It was killed illegally by a squirrel hunter with a .22 rifle.

be found in the state. It is definitely known that at least 100 young turkeys were raised during the past season.

A considerable amount of turkey management work has been done on this area. A total of four food plots with a combined acreage of approximately 25 acres has been cleared, plowed, fenced, and planted to supplemental turkey food.

These plots were planted to wheat, buckwheat, Austrian winter peas, clovers, chufas, and millet. All plantings were very successful and have been heavily utilized by turkeys.

Other phases of turkey management included predator control and maintenance of self-feeders for turkeys.

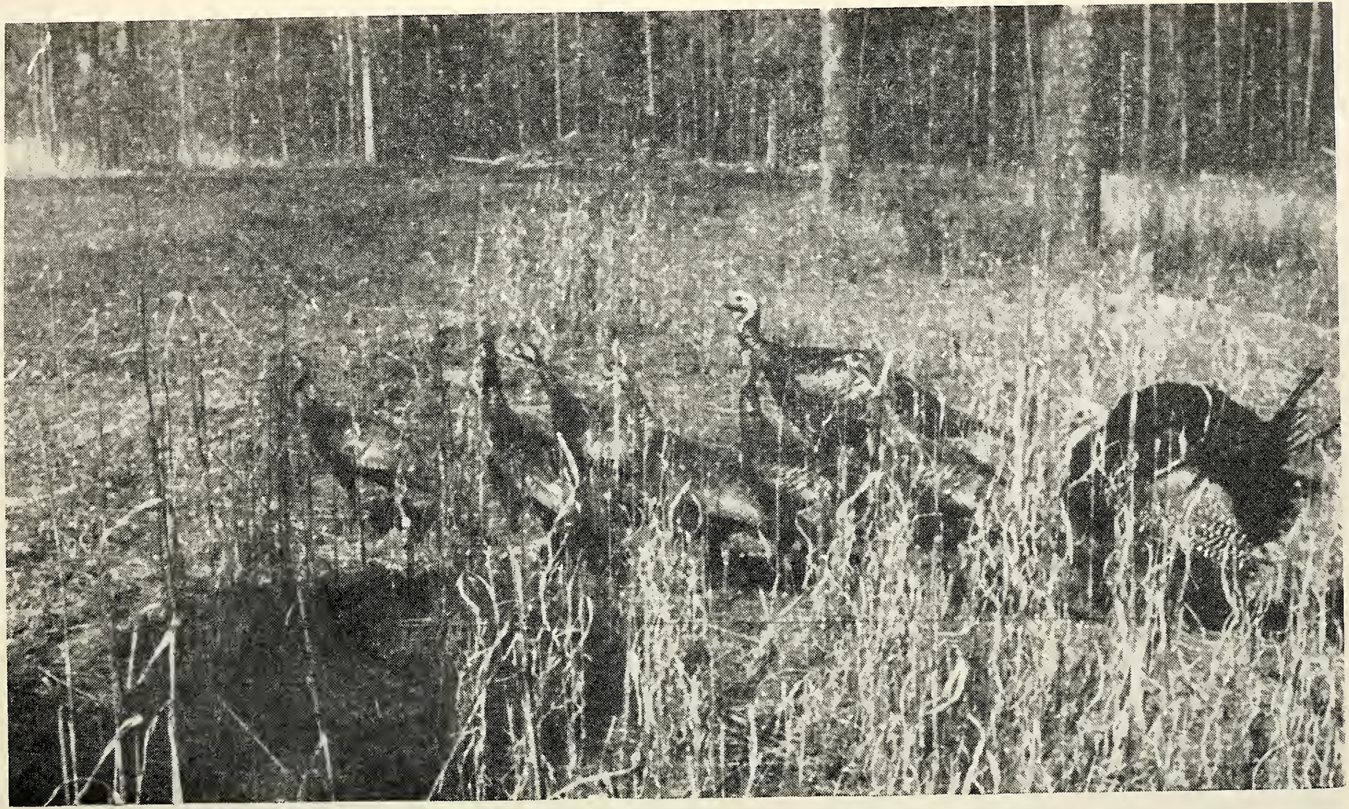


FIGURE 3—Game farm turkey released on a game management area. A total of 1,332 turkey of this type have been released on game management areas in the state.

CALDWELL PARISH GAME MANAGEMENT AREA

Flavil D. Hollis, Game Technician; Welch Lively, Refuge Manager

Caldwell Parish Game Management Area is located in the southeastern portion of Caldwell Parish. It comprises an area of approximately 10,000 acres of second-growth hardwood. The topography is relatively flat and poorly drained.

This land was leased without fee from private owners for wildlife management use.

Although this area supports a large number of cattle and hogs, it still contains good deer range.

Deer

A total of 93 deer have been released on this area since it was set up for game management purposes in October, 1949.

These deer have had a good rate of survival. Deer may be seen frequently on the game management area.

There were no deer in this part of Caldwell Parish prior to these releases.

Turkeys

A total of 217 game farm turkeys have been released on this area. These turkeys have become widely scattered and it is impossible to determine the rate of survival. However, observations, tracks and other signs indicate that a fair number of these turkeys are still on the game management area and some reproduction is evident.

Turkey management consisted of clearing, fencing, and planting to supplemental turkey food four food plots with a combined area of approximately 18 acres. These plantings consisted of crimson clover, wheat, buckwheat, Austrian winter peas, millet, chufas, and soybeans. The plantings made excellent growth and were utilized extensively by the turkeys.

Other phases of turkey management included predator control, and maintenance of self-feeders.

Squirrels

A total of 200 squirrels were released on this game management area. It has been impossible to determine the success of this release; however, the area contains a high population of squirrels at this time.

UNION PARISH GAME MANAGEMENT AREA

Flavil D. Hollis, Game Technician; C. L. Hollis, Refuge Manager

The Union Parish Game Management Area is located in north-central Union Parish and comprises an area of approximately 10,000 acres. It contains second-growth loblolly and shortleaf pine and mixed hardwoods with a heavy growth of underbrush and is interspersed throughout with numerous spring-fed streams. The topography is rolling hills with a top soil of sandy loam.

Use of this land for wildlife management purposes was obtained from private owners by long term lease without fee.

This type of habitat is excellent for deer and turkey propagation.

Deer

Prior to release there were no deer in this part of Union Parish. Since the inauguration of this project a total of 67 deer have been released.

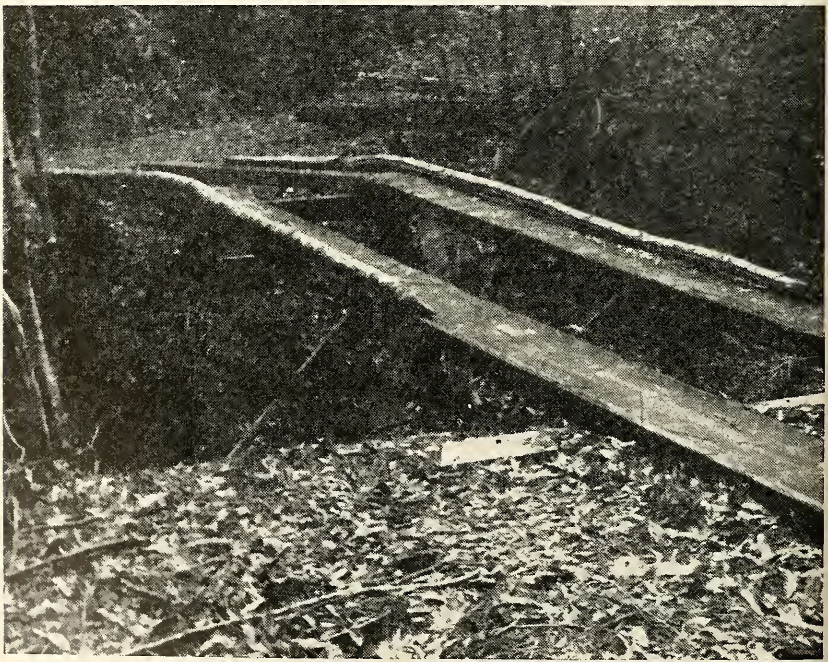


FIGURE 5—Semi-permanent type of jeep bridge built on game management areas.

These releases have been highly successful and the area contains a good stocking of deer at present.

Turkeys

During the preliminary investigation it was reported that a flock of wild turkeys used this area; however, no substantiating evidence has been found since the project was put into operation.

A total of 92 game farm turkeys have been released on this area. These turkeys have become widely scattered and it is impossible to determine the rate of survival; however, it is definitely known that a good portion of these survived and that there has been some reproduction.

Turkey management on this area consisted of clearing, fencing, and planting to supplemental turkey food four plots with a combined acreage of approximately 20 acres. These plantings consisted of Austrian winter peas, wheat, buckwheat, chufas, millet, soybeans, and crimson clover. These plantings were fertilized at the rate of 200 pounds per acre of commercial fertilizer. The plantings were highly successful and have been used regularly by turkeys.

Other phases of turkey management included predator control and maintaining self-feeders for turkeys.

SABINE PARISH GAME MANAGEMENT AREA

Clyde E. Harrison, Game Technician; Lloyd Alford, Refuge Manager

The Sabine Parish Game Management Area is located in south-central Sabine Parish and comprises an acreage of approximately 8,000 acres. In general this tract of land is well drained with an abundant supply of water in the form of creeks. It contains good stands of second-growth longleaf, shortleaf, and loblolly pines and mixed hardwood.

This land was acquired for wildlife management purposes by long term lease from the private owners. It is established as a Federal-Aid game management area in the spring of 1951.

Deer

A total of 57 deer have been released on this area. This release was fairly successful as these deer have remained on and around the game management area.

Turkeys

A total of 174 turkeys have been released on the Sabine area. The rate of survival has apparently been very good since turkeys and turkey signs have been observed throughout the year.

Turkey management on this area consisted of establishing self-feeders for the turkeys and predator control. No supplemental turkey food plots were planted because of the numerous fallow fields on the area furnish ample turkey food.

Squirrels

A large portion of Sabine Game Management Area is excellent squirrel range and contains an abundance of squirrels. However, 100 squirrels were released for experimental purposes. These squirrels were eartagged and marked with dye prior to release.

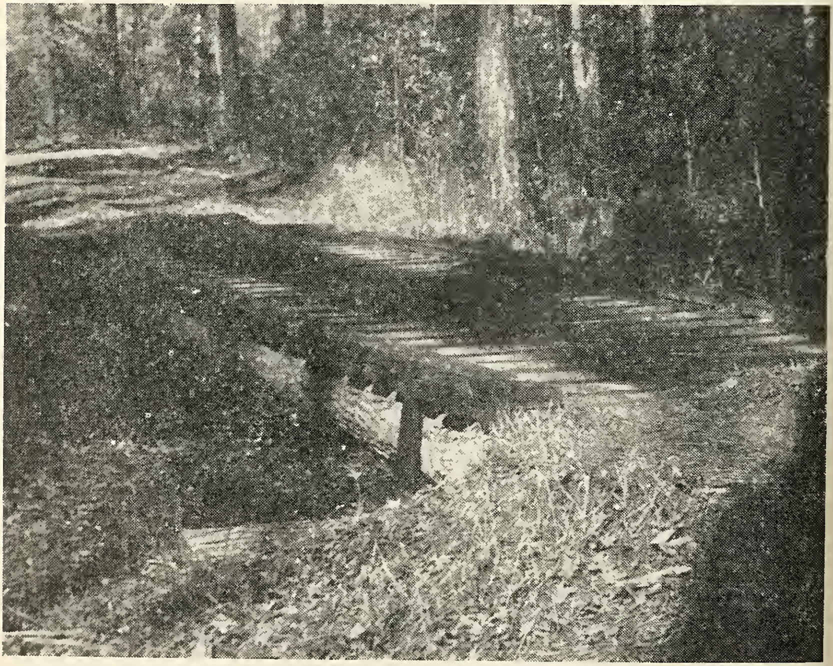


FIGURE 6—Permanent type of jeep bridge built on game management areas.

GRANT-RAPIDES PARISHES GAME MANAGEMENT AREA

Rowland P. Vernon, Game Technician; Thomas Earl Deen, Refuge Manager

Development work was begun on May 1, 1951, on the Grant-Rapides Parishes Game Management Area. It comprises an area of approximately 7,700 acres, located along the east bank of the Red River in Grant and Rapides Parishes.

In general the area is flat and poorly drained, with an abundant supply of water furnished by bayous. It contains an excellent stand of Red River bottomland hardwoods, with a heavy stand of undergrowth.

It is interspersed throughout with old, fallow fields and is considered by game technicians to be excellent deer and turkey range.

The use of this land for wildlife management purposes was obtained from the owners by long term lease without fee.

Deer

There were no deer on this range prior to release. A total of 50 deer have been released on this area. These deer have had a good rate of survival and are remaining on or near the game management area.

Turkeys

A total of 48 game farm turkeys have been released on this game management area. Although these turkeys have become widely scattered since released, it is thought that there was a good rate of survival.

Turkey management work on the Grant-Rapides area consisted of clearing, fencing, and planting to supplemental turkey food two plots with a combined acreage of approximately 11 acres. The species planted were the same used on other game management areas. These food lots have been used extensively by turkeys since they were established.

Other phases of turkey management work consisted of maintaining self-feeders for turkeys and predator control.

JACKSON-BIENVILLE PARISHES GAME MANAGEMENT AREA

Rowland P. Vernon, Game Technician; Floyd Sizemore, Refuge Manager

Development work was begun on the Jackson-Bienville Parishes Game Management Area on June 1, 1951. It comprises an area of approximately 15,500 acres, located in the northwest corner of Jackson and the northeast corner of Bienville Parishes.

The terrain is rolling hills with numerous spring-fed streams. It contains a mixture of loblolly and shortleaf pines and hardwood with a heavy understory of brush. The habitat is excellent for deer, turkeys, and squirrels.

The use of this area for game management purposes was obtained from private owners by long term lease without fee.

Deer

A total of 40 deer have been released on this area. All of these deer were does, which were trapped in Madison Parish during the past trapping season.

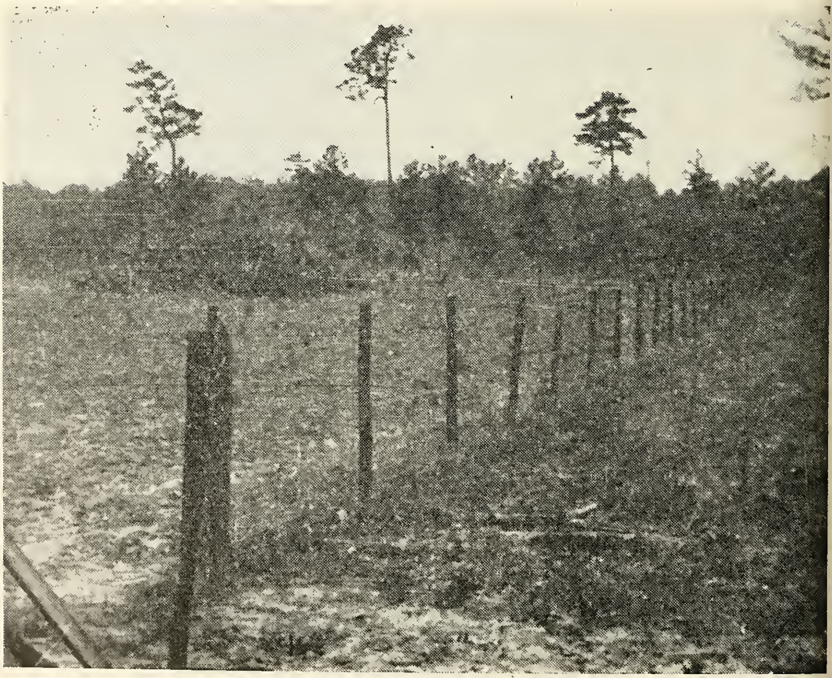


FIGURE 7—Hog and cattleproof fence around a five-acre turkey-food plot. A total of 32.6 miles of fence similar to this was constructed during the past two years.

The refuge manager reports a good rate of survival of these deer. This area contained a fair stocking of deer prior to the release. With the continued good cooperation of citizens of Jackson and Bienville Parishes, in eight or ten years this area will contain one of the highest deer populations in the state.

Turkeys

A total of 48 game farm turkeys have been released on this game management area. According to reports by the refuge manager the turkeys have had a fairly good rate of survival and there is a good possibility of establishing wild turkeys again on this range.

Turkey management work consisted of clearing, fencing, and planting to supplemental turkey food four food plots with a combined acreage of approximately 20 acres. These plantings consisted of wheat, Austrian winter peas, and clovers. They have made excellent growth and have been used extensively by the turkeys.

Other phases of turkey management work were maintaining self-feeders for the turkeys and predator control.

ZEMURRAY PARK DEER PROPAGATION AREA

Flavil D. Hollis, Game Technician; Fred Joiner, Refuge Manager

The Zemurray Park Deer Propagation Area is a 5,000 acre tract of land, located in central Tangipahoa Parish. The terrain is gently rolling and well drained with numerous, small spring-fed streams. The timber types vary from stands of second-growth longleaf pine to stands of mixed hardwood in the creek bottoms.

The entire area is surrounded by an eight foot deerproof fence. The use of this land for deer propagation work was obtained from the owner by long term lease without fee.

Within the last decade this area contained a large number of deer. However, in recent years, the number of deer has been greatly reduced by poaching.

Through proper management the existing herd will be increased to the point where a substantial number may be trapped each year for transplanting in depleted deer range within the state.

Management work on this area consists of repair and maintenance of the deerproof fence, clearing and planting a 10-acre plot to supplemental deer food, and control burning.

DEER TRAPPING AND TRANSPLANTING

Flavil D. Hollis, Rowland P. Vernon, Game Technicians

Bill Gates, M. W. Bedgood, Trapping Aids

The work of trapping and transplanting of deer within the state was taken over by this project July 1, 1951.

For results of this operation, see Project 14-D (deer trapping and transplanting).

SUMMARY OF DEVELOPMENT WORK ON PROJECT 23-D

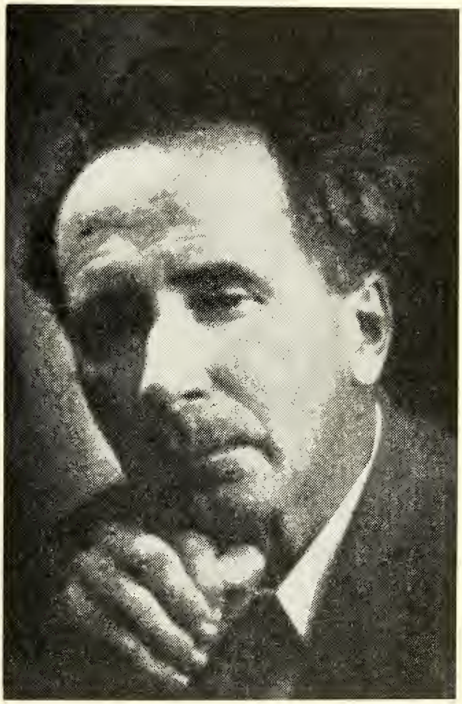
	Red Dirt	Catahoula	Evangeline	West Bay	Livingston	Caldwell	Union	Sabine	Grant-Rapides	Jackson-Bienville	Zemurray	Total
Deer released	0	13	69	193	42	93	67	57	50	40	0	624
Turkeys released	109	126	30	413	75	217	92	174	48	48	0	1,332
Squirrels released	0	0	0	300	0	200	0	100	0	0	0	600
Fence constructed (miles)	5.5	10.6	5	2.5	1.5	1.7	1.6	0	.7	1.5	2	32.6
Bridges built	81	2	26	25	3	3	6	6	0	5	4	161
Water gates constructed	43	17	12	0	0	0	0	0	0	0	8	80
Roads constructed (miles)	39	10	25	25	19	14	11	17	5	9	5	179
Firelines plowed (miles)		0	0	5	48	0	0	0	0	0	0	88
Control burned (acres)	5,000	0	0	640	0	0	0	0	0	0	0	5,640
Supplemental quail food planted (acres)	173	0	0	0	0	0	1	0	0	0	0	174
Supplemental turkey food planted (acres)	34.8	12	0	16.8	25	18	20	0	11	20	0	157.6
Supplemental deer food planted (acres)	0	0	0	0	0	0	0	0	0	0	10	10
Ponds constructed	0	2	0	1	0	0	0	0	0	0	0	3
Experimental food and cover plantings (acres)	15.5	0	0	0	0	0	0	0	0	0	0	15.5
Land cleared (acres)	20	40	0	20.7	25	18	18	0	11	20	10	182.7
Fences maintained (miles)	48.8	10.6	25	2.5	1.5	1.7	1.6	0	7	1.5	12	112.2
Turkey conditioning pens constructed	2	2	2	3	2	2	4	2	2	2	0	23

PREDATOR CONTROL ON PROJECT 23-D

	Fox	Raccoon	Opossum	Skunk	Bobcat	Wolves	Housecat	Hogs
Red Dirt	68	56	6	15	34	3	0	237
Catahoula	48	27	5	4	13	0	0	30
Evangeline	94	30	0	10	2	0	9	20
West Bay	107	74	15	75	52	0	5	0
Livingston	1	90	23	31	0	0	0	0
Caldwell	6	43	0	12	0	3	0	0
Union	54	16	13	2	0	0	1	0
Sabine	167	3	29	1	1	0	0	15
Grant-Rapides	2	1	4	7	0	0	0	0
Jackson-Bienville	101	14	43	20	8	0	0	0
Zemurray	..	..	..	..	..	..	..	..
TOTAL	648	354	138	177	110	6	15	302

REPORT OF CHIEF BIOLOGIST

JAMES NELSON GOWANLOCH



James Nelson Gowanloch

THE biennial reports of the Louisiana Department of Wild Life and Fisheries and of its predecessor, the Louisiana Department of Conservation, serve not only as an official report to the Legislature, but since they are distributed not only to the members of that governing body but also to various levels of educational institutions throughout the state, to libraries and to other institutions, they constitute a much sought after series of references of permanent value. The degree to which this is true can only be comprehended by a person who has been long familiar with the way in which the information in these volumes—which now constitute a continuous series stretching back over a period of 40 years—is sought after as a source of data for all manner of purposes from preparation of legal briefs to rapid access to various conservation procedures and specific problems of techniques.

For this reason the present report will include discussions of some of the questions concerning which the writer constantly receives a continuous flood of inquiries. The activities of the chief biologist cover many fields, including the planning and conduct of long range investigations involving problems of fresh water and marine fisheries in their related biological and economic aspects, the complex interaction of such diverse factors as, for example, crayfish; a fur bearer, the mink; public health; and a single species of bird, the white ibis, in which the writer cooperated with various other state and federal agencies. Constantly arising, also, are equally complicated problems which are the product of the changing Louisiana environment which, through such factors as altered surface drainage conditions evidently in specific instances, result in disastrous impact upon local fisheries, both in economic and sport aspects.

The studies of such matters as lake conditions are essentially long range in character; particularly is this true of Louisiana where, as every duck hunter knows, the balance of natural conditions is often delicate, with the result that fluctuations in water level may produce profound and relatively lasting effects. Thus, for example, the opening of the Bonnet Carre Spillway so influenced areas of Lake Pontchartrain that the marks of that effect were not erased until six years had passed. This program, therefore, requires the accumulation of data on the individual lakes covering such fields as the changes in levels, the changes in chemical composition of the water, the succession of plant life, the composition and growth of important elements in fish populations and, of highest importance, the changes due to pollution, alteration of land use or population in the watersheds which contribute to the particular lake or other body of water concerned.

A program for the collection of such data is in operation. The discussion which hereinafter follows is set forth to answer some of the questions which the writer constantly receives from sportsmen, commercial fishermen and other persons interested in this field of our Louisiana natural resources.

The problems of both fresh water and marine commercial fisheries are equally a concern of the chief biologist and with relation to these, he has been much engaged—particularly in the case of the marine fisheries—in a program of work which is the function of the Gulf States Marine Fisheries Commission. The writer, who was engaged in the activities directed toward the formation of this Commission since its initial inception in 1946 and who has served as chairman of the correlating committees on biological activities, will later in this report set down some statement concerning the nature of this field of endeavor and will therein indicate how already greatly fruitful in increased knowledge of the Gulf of Mexico—information capable of most practical usefulness in the commercial exploitation of the Gulf of Mexico—these researches have been.

The number of inquiries that are received by the Biological Research Section is unceasing. It is for this reason there are here presented compact surveys of the biological facts relating to chosen important forms of our wildlife which have been the subject of more questioning than any other elements of our conservation pattern. Inasmuch as the data concerning Louisiana are almost unavailable in any library, it is hoped that recording these facts here will make them accessible to many who seek them.

LAKE MANAGEMENT

A casual fisherman often regards a lake as a sort of automatic "fish factory," upon the operation of which he blames any deficiency of fishing skill on his part and, all too often, characteristically ascribes the lake's failure to the first obvious thing upon which his eyes may fall. Lakes, quite otherwise, are extraordinarily complex.

"Lake management" is a broad, almost all-inclusive term, covering the application of our knowledge of the biology, physics and chemistry of lakes in practical ways that will create and maintain conditions in a lake that are desirable for their usefulness to man.

The objective of this discussion is to make available to the sportsman in some compact and understandable way basic principles, basic problems and basic corrective procedures involved in "lake management."

Lakes profoundly differ. Even regions of even small lakes profoundly differ. The most amateur fisherman quickly learns how true this is, but few sport fishermen, even many of long experience, understand the complexity, the often conflicting and turbulent activities that are enacted beneath the waters into which he so cheerfully casts his line. Few comprehend that such a simple thing as the abundance of microscopic green plants, the very beginning of the fish "food chain" or the abundance of water fleas, another link in that chain, may be the decisively controlling factors of fishing success.

Lake problems have been studied with progressive skill and accuracy the world over. Hundreds of volumes and literally tens of thousands of technical papers in a score or more of languages have been written concerning this field of human interest. Discoveries have been made and control measures devised that have in succession modified completely the pattern of lake management procedures. These generalizations, necessary to indicate the sweep of the field of lake biology, will be implemented by specific examples hereinunder given.

Lakes may serve many purposes but no single lake can serve all useful ends. Thus, a fishing lake cannot at the same time be developed to its full possibilities as a duck lake. An excellent Louisiana example of this is Catahoula Lake in LaSalle and Rapides Parishes. The reverse situation is, oddly enough, also true. Thus, a thoroughly successful water supply lake may at the same time be managed as an equally successful fishing lake. A good Louisiana example of this is Cross Lake in Caddo Parish.

The intricacy of balance in a lake is almost beyond comprehension. Presence or absence of a single biological factor, even a single species, may be decisive. A classic example was the case of a lake in the Yellowstone where disastrous trout epidemics were found to be due to the presence of pelicans, the birds serving as one of the hosts in the life cycle of parasitic worms. The pelicans were removed. The disease disappeared. The character of the lake may be completely changed by a single physical factor, thus the extraordinary usefulness of Catahoua Lake (already mentioned above) as a duck feeding and duck hunting ground dependent largely upon the fact that this drying out of Catahoula during the summer months permitted the profuse growth of chufa grass, the nutlets of which by their fall abundance attracted and held large duck populations.

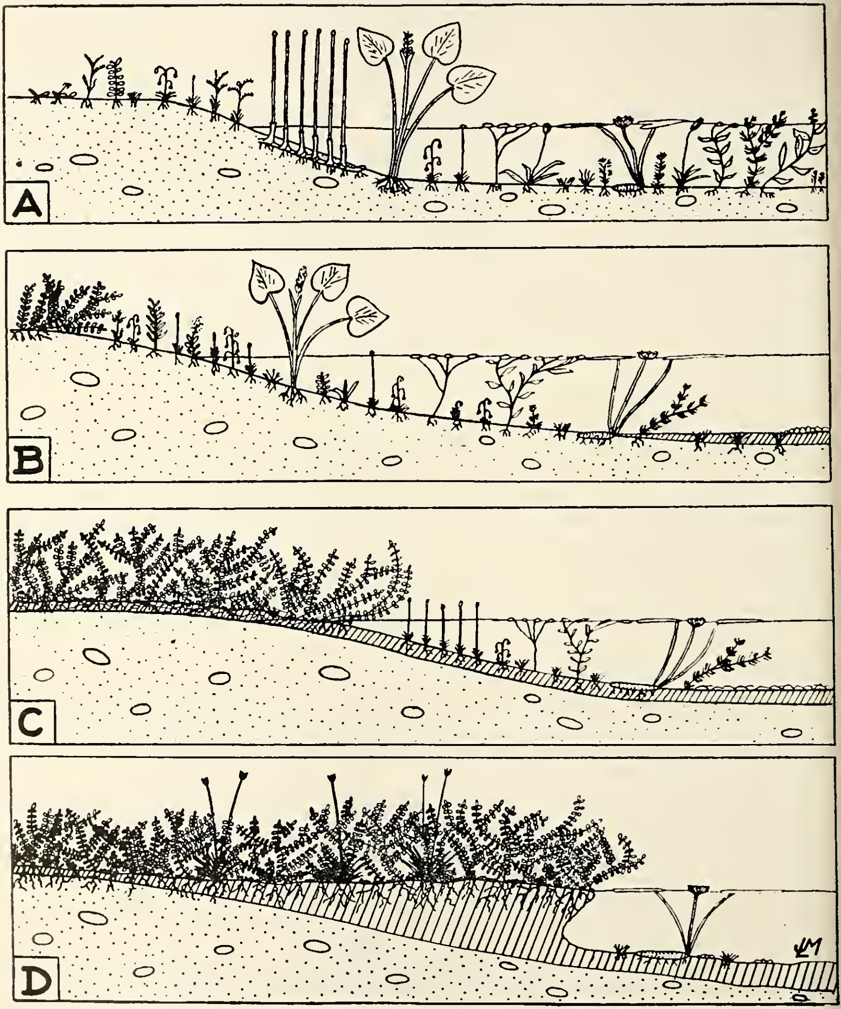
Lakes, like individuals, age, but in the case of the lake the successive phases of its age often include stages of particular usefulness. Fortunately, the aging of a lake may be controlled, accelerated, arrested or even reversed by practical measures that will insure fishing success. Particularly useful in this matter is the comparative study of natural and artificial (impounded) lakes. Even more illuminating in some respects is the comparative study of artificially impounded lakes existing under similar circumstances apart from the fact that one is controlled and the other is permitted to age without interference. A perfect Louisiana example of this is that of Miller's Lake and Lake Chicot in Evangeline Parish. These two bodies of water are barely 5 miles apart in direct line and are each 2,000 acres in area, yet by experimental control Lake Chicot has been developed as a fishing lake while Miller's Lake, the primary purpose of which is to provide rice irrigation water, has grown progressively older and is emphatically a good waterfowl habitat. Some further reference to this precise example will be given later.

The understanding of the history of such lakes often provides the key to maintaining lake productivity. Aging of lakes differs greatly in the case of inland fresh water lakes in contrast with lakes being formed at the sea's edge. The accompanying illustration, which will later be more fully explained, shows how trapped silt brought in by surface drainage or by tributary streams gradually accumulates, gradually is invaded by a succession of plants characteristic of shallow water as the lake continuously becomes shallower and in the end the once valuable fishing lake may become transformed into a nonproductive marsh.

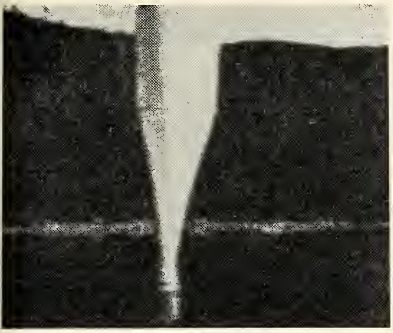
Fish, like all life, both animal and plant, depend basically for their existence upon the atomic energy created in the sun. The plants alone are capable of utilizing this radiant power to synthesize their substance out of the basic, simple substances —carbon dioxide and water. They transform these—for animals, unavailable yet almost omnipresent—simple substances into the complicated things that animals use as food.

Thus are built up what are termed "food chains" which, in the case of lakes, begin with microscopic plants and end up in the form of our desirable game and commercial fish. The links in these chains are many, among the significant elements being water fleas and many other forms of crustacea such as crayfish and thousands of species of minute organisms that are so unknown to the public that they have not even acquired any common name, a huge variety of different kinds of "worms," insect larvae and various fresh water mollusks. Failure of several links or sometimes failure of a single link in the food chain may mean complete failure of the lake. It is, therefore, necessary that the scientist study the lake and its minute life with the best equipment available. The illustration shows as an example a

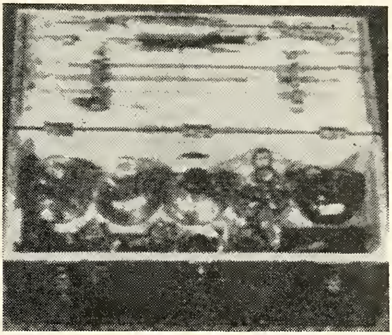
No. 20 plankton net. Plankton nets are made from "boltink silk," textiles chiefly used in commerce for the screening of flour, face powder and other finely particulate commodities. The meshes vary and in lake studies are used in a variety of descending sizes so that the elements of the plant and animal organisms forming the food chain can be more easily sorted out by size for convenience in study.



Here illustrated is the dramatic succession of plants in a seepage lake. Progressively, as the silt, trapped by the shoreward vegetation accumulates, the plants march lakeward as the lake "ages." (After L. R. Wilson).



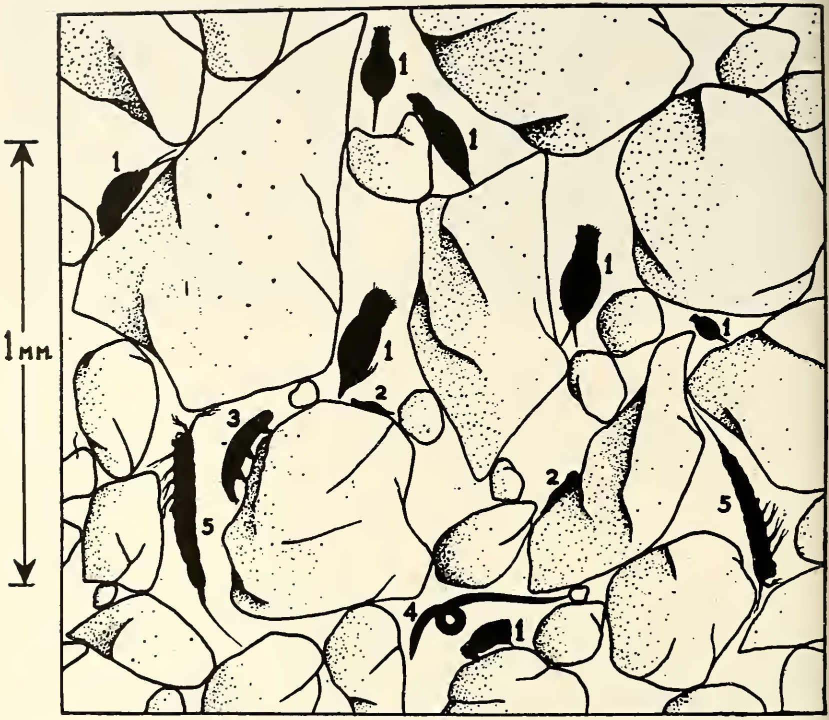
Expensive plankton nets like the above accurately strain lake water to secure the measure of minute plants and animals, essential stages in the fish "food chain." Although hand woven, the finest of these nets contain approximately 30,000 openings in every square inch. (**After V. E. F. Solman.**)



Using this compact chemical field kit, the biologist is able to determine with surprising exactness dissolved oxygen, acidity, alkalinity and other characteristics of lake water essential for the welfare of fish. (**After V. E. F. Solman.**)

Extraordinary as it may seem, these nets of silk are hand woven, the industry being traditionally centered in Zurich, Switzerland. The almost incredible fineness of the No. 20 net can be realized when it is noted that the mesh runs 168 threads to the linear inch, or, in other words, a single square inch of a No. 20 net contains approximately 30,000 straining apertures. Such nets are dragged through the water at uniform speeds for uniform periods of time. Their contents are then preserved for subsequent study.

The accompanying illustration shows how minute are many of the animal organisms that play roles of varying importance in the food chains. Here shown is a tiny bit of a lake sandy beach showing the relative size of the microscopic animals present in relation to the size of the sand grains. Superficially, it would seem that the sand is so closely packed, no space is available in which animals could dwell. Here, indicated by number, are shown five different kinds of animals living therein. Not one fisherman in a thousand has probably even heard their names. *Rotifers* (their "common" name "wheel animalcules" is equally unknown) are designated by the numeral 1. *Gastrotricha,* designated as 2, are among the smallest of all known multicellular animals. Some of these minute "worms" are less than one four-



The above complicated illustration represents a small portion of a lake sandy beach. It shows the relative size of the sand grains present and of the minute animals living among them. Their small size can be comprehended when it is realized that the scale at the left (arrowhead to arrowhead) represents only one twenty-fifth of one inch. The kinds of animals are indicated by number. Their names and further explanation of them is given in the text of this article. (After Pennak).

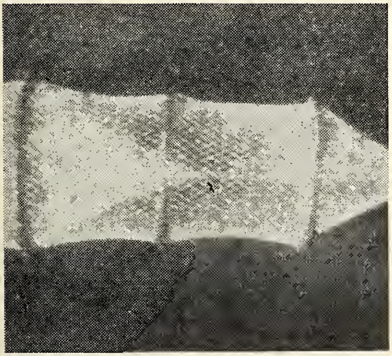
hundredth of an inch in length. The *Tardigrada*—their only other name is "water bears"—are numbered 3. The *Nematodes* (also called "threadworms") are numbered 4. The *Harpaciticoid copepods* (these could vaguely be called a kind of water flea) are numbered 5. The scale at the left of the illustration, arrowhead to arrowhead, measures only one twenty-fifth of an inch.

Light is an important factor in lake welfare. Absence of light, due to a heavily suspended silt load of the water or to dense floating vegetation, may render a lake barren of fish. Too much light, on the other hand, may under many circumstances create a profusion of underwater vegetation so great that the value of the lake is destroyed. Techniques for the control of light will be here briefly discussed. Light penetration is often, also, cause for astonishment on the part of the fisherman. Having caught a fine string of white crappie (we call them "white perch") in clear water where their markings are striking, he may proceed to an area shadowed by vegetation or silt and upon lifting his fish will discover to his surprise that the sharp markings they previously possessed have now faded because of absence of light.

Some additional idea of the almost astronomical numbers of organisms present in the waters of a productive lake may be gained by contemplating the following figures. It must be remembered that bacteria likewise play a highly important role in fishing lakes. The following are carefully calculated estimates of the number of the various types of life that have been found to be present in *one teaspoonful* of accurately collected lake water:

	in one teaspoonful
Water bears	3
Water fleas	10
Rotifers	5,500
Protoza (these are one-celled animals)	250,000
Bacteria	40,000,000

These are not from the same teaspoonful of water but represent maximum figures obtained from samples taken from differ-



Shown here in part is a hoop-net, one of the types of gear used in anlyzing fish populations of a lake. **(After V. E. F. Solman.)**

Captured by an Ekman dredge, these diverse lake bottom animals are examples of typical lake bottom fish food. **(After V. E. F. Solman.)**

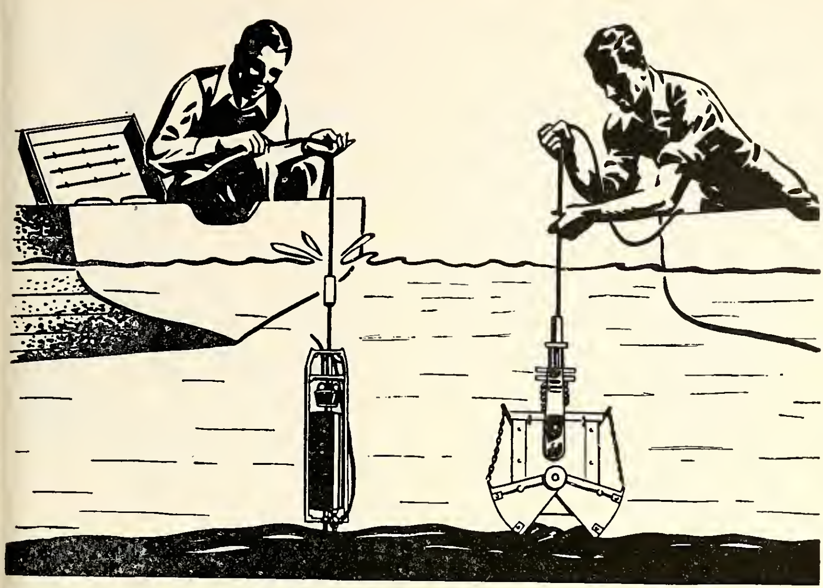
ent lakes. Naturally, in one type of lake one type of organism may be dominant; in another type of lake, other forms take precedence in numbers.

Sampling of the larger animals in the lake, such as fish, turtles and large crustacea, must be done by other methods. These include direct angling, which, because of a wide variety of differences in response on the part of fishes, may provide a misleading sample and must, therefore, be supplemented by other procedures. Seines, minnow nets, trammel nets and hoop-nets used in conjunction with angling serve usefully to fill in the whole picture. The hoop-net, here illustrated, is of the type most frequently employed. Measuring some 18 feet in length, it is what is known as a double fyke net and is the net commonly used by commercial fishermen. Provided with wide walls (which by law cannot be used in commercial fishing operations), the hoop-net efficiently samples fish and turtle populations.

Sampling of the biological contents of lakes by all of these methods must be carried out in a systematic program so that the seasonal changes may be accurately ascertained and interpreted in practical lake management terms.

The composition of the water of a lake is obviously of basic importance. Water samples must be secured with precision and subjected to a long series of often tedious analyses. The accompanying illustration shows one type of such "water sampler" which can be lowered to desired depths and "fired" by a sliding weight, thus tripping the mechanism and sealing off the sample in the exact level where taken. Simultaneously, by other highly complicated devices, the exact temperature of the water at that spot and level can be recorded. The water sample itself must immediately be tested in the field for such important chemical characteristics as the dissolved oxygen present. Absence of dissolved oxygen will cause immediate death of fishes with sometimes sweeping and devastating fish kills. The accompanying illustration shows the type of compact chemical field kit that the biologist uses in his on-the-spot, detective work. Larger samples are secured for special problems and subjected to still further complicated study.

It must be emphasized that water charactertistics alone, while essential, are not alone the answer to lake problems.

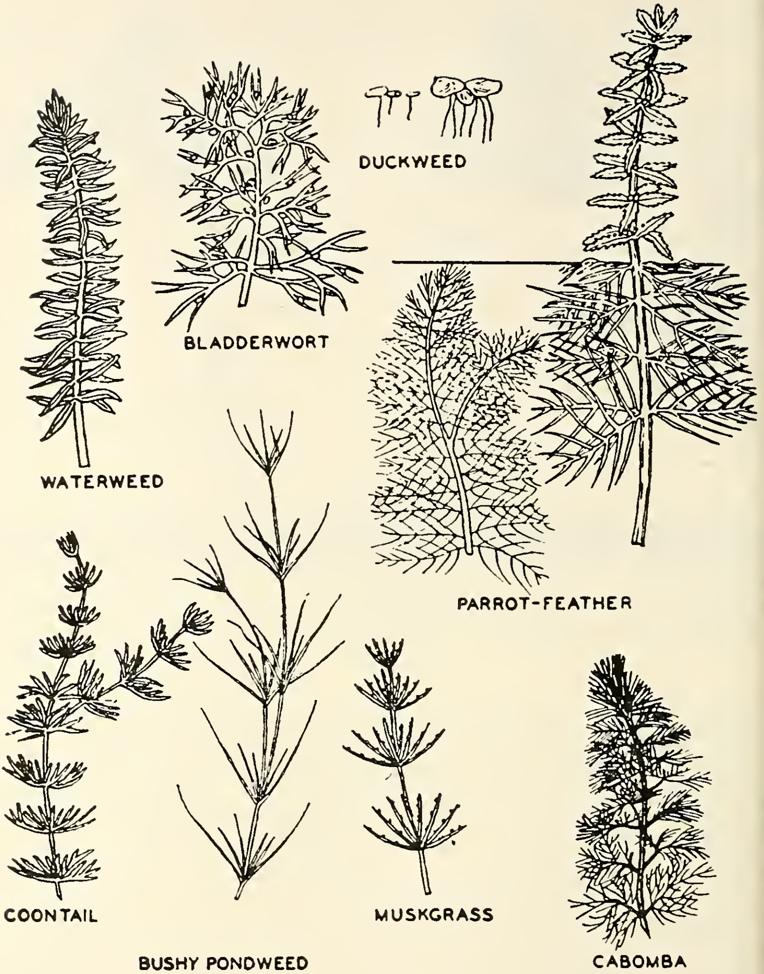


Water sampling and bottom sampling are essential in lake studies. Left: this device collects a water sample which can then be studied for dissolved oxygen and other important characteristics. Right: The Ekman dredge automatically collects an exact sample of bottom material which will be examined for abundance of fish food and other lake management factors. (After V. E. F. Solman).

Through many years, the writer has become accustomed to receiving from optimistic sportsmen a gallon jug of water sent in, in the hope that it alone will reveal upon analysis why they cannot catch fish. It is only when other data from methods described above are correlated with water chemistry that any useful recommendations for management procedures can be made.

Other instruments are necessary to secure samples of the animals living on the lake bottom in the mud or in the decayed vegetation. Illustrated here is an Ekman dredge, which is a traplike box capable of being "fired" by a weight called a "messenger" which trips the mechanism and causes the instrument to pick up a characteristic bottom sample. The material is then sorted through metal screens, the finest of which may contain 1,600 openings per inch. The 36-square-inch Ekman dredge has been known to pick up more than a thousand individual animals in a single test.

Probably the most conspicuous of all visible factors in a fishing lake are the abundance and kind of vegetation present.



The above illustration shows the general appearance of some of our commonest aquatic plants with finely divided leaves. Further detail of the diagnostic leaf formation can be found in the other set of illustrations reproduced with this article. Following are the common and technical names: Waterweed (Anacharis, formerly called Elodea); Bladderwort (Utricularia); Duckweed or Duckmeal (Lemna and other genera such as Wolffiella); Parrot's Feather (Myriophyllum) (Note the completely different structure of the leaves that emerge above the water surface.); Coontail (Ceratophyllum); Bushy Pondweed (Najas) (Very many species of pondweeds occur, differing profoundly in leaf size.); Muskgrass (Chara); and Cabomba, popularly given in Louisiana the meaningless name of "Water Moss." (After Marion Toole).

Lake vegetation may be broken down into six categories:

First, forest canopy provided by trees growing in the lake;

Second, the emergent aquatic vegetation such as certain types of water lilies and the young stages of the American lotus;

Third, floating vegetation such as the common fragrant white water lily and that strange plant (olive green above with under side of the leaves and submerged stems bright maroon covered with clear jelly) known as the water shield. Here, too, belongs that strange group of plants known as "duck meal." One of these, the technical name of which is *Wolffia,* although no larger than the head of an ordinary pin, is actually a flowering plant, complete with a blossom so small that it must be microscopically examined to see it at all;

Fourth, submerged vegetation such as coontail and the various types of "water moss." "Water moss" is an absolutely worthless term applied popularly to a wide variety of entirely unrelated plants;

Fifth, planktonic plants. These are microscopic plants that drift about on the water and have no roots. They include such microscopic forms as the diatoms and desmids. Minute as they are and unknown as they are by sport fishermen, these planktonic species are frequently absolutely essential links in the food chain, for without them water fleas often could not exist; and,

Sixth, encrusting plants. These include various forms which grow on stones, pilings or other surfaces and often lay down heavy deposits of lime. Their part in the food chain is negligible.

Plants are extremely important in the welfare of a fishing lake. Their control may render a barren lake fertile and, when out of control, they may destroy the finest fishing lake in existence.

The presence of plants, desirable or undesirable, is the result of the most complex interplay of forces imaginable. Their practical control involves the most careful interpretation of information that can be gained about a lake and the application of one or many available treatment procedures, one of the most useful of which is the systematic control of water level.

Fish hatcheries on the whole are not at all similar in character in the "deep south" to fish hatcheries in the north. It is not practical to "strip" our southern game fish and rear them artificially, as is the practice with many northern game fish. Instead, the fish are reared in ponds instead of (as is the case of brook trout and northern pike) in hatchery glass jars and thus the great expense of caring for and feeding these fish is eliminated.

Furthermore, due to the vacillations of the vast Mississippi, an incalculate number of valuable game fish are delivered free of charge at the sportsman's doorstep. When the Mississippi recedes, these fish, which would otherwise die, are now saved for the sportsman. Major James Brown has been carrying out unprecedented fish rescue operations utilizing the very latest techniques which involve the use of the most efficiently designed fish rescue trucks. These rescued fish are already well along in growth or, as is true, many thousands of them already of legal fishing size. They have come through successfully the dangerous parts of their lives without a penny of cost to the State of Louisiana.

Age and Growth of Fish

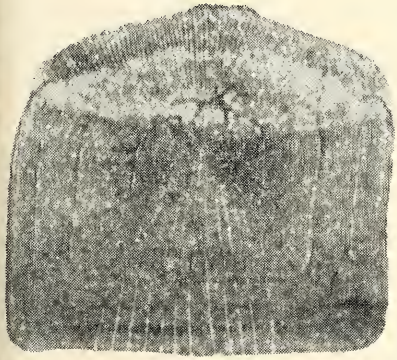
The determination of the age of fish in relation to size, availability of food, lake temperatures and especially the growth rate in precise lakes forms one of the fundamental problems of lake management.

Fortunately, fish tell their age in at least three ways: first, their scales, earliest and still most used method; second, their ear stones (otholiths); and, third, and most recently developed, the rhythmic growth of the button-like central part (centrum) of each segment of the backbone.

It has long been known that trees in response to seasonal growth lay down concentric, readable rings, wider in summer when growth is rapid, narrower when the lower temperatures and slower growth of the winter season become so close to each other that they form a definite ring marking, under most circumstances, each year.

A fish scale is a complicated structure (as a matter of fact, fish scales are actually the structures from which those later animals, the birds, derive their feathers and from which we human beings derive our 34 teeth). Fish scales are widely variable in appearance, depending upon the group of fishes or the precise species of fish that grow them, but they are fundamentally alike in basic structure. Their range may be realized by referring to the accompanying illustrations, each of which is exactly identified.

Contrary to popular belief, many fishes regarded as scaleless actually possess deeply buried scales, such as the common eel. Scales may be imbricated, i.e., overlapping like the shingles on a roof. This is one of the most common patterns. In such instances, part of the scale is buried and unseen, part exposed and overlapping. Oddly enough, no fish has more scales than it started out with. Loss of a scale leads to regeneration or deep wounds to scar tissue, eliminating scale development.



Scale of White Bass (Lepibema chrysops), called in Louisiana the Barfish. Exposed part of scale is the light lower area. This scale shows four annual rings and is thus four years old. Note that growth during the fourth year is quite small. **(After Sigler.)**

A "regenerative" scale from a Yellow Bass (**Morone interrupta**), a common Louisiana fish. This represents replacement of a lost scale and shows abnormal pebbly central area, useless for age determination. **(After Carlander.)**

Ordinarily, a scale consists essentially of a center of growth surrounded by added growth at the scale edge in the form of rings, termed circuli. The illustration shown of the white bass clearly reveals that in some cases these circles (circuli) can become almost square. Each such scale addition laid down depends in size upon the rapidity of growth of the fish which in turn depends on a number of factors such as temperature, food supply and vitality. Because of the greater temperature differences that occur in the north, scales are much more easily read. However, even in the deep south by application of precise techniques, it is possible to determine these yearly "growth rings." The scales may be examined directly after being scrubbed and otherwise prepared, or by newer techniques, a more useful examination may be made of the impression of the scale in a plastic rather than the original scale itself.

The following figures derived from commercial fish taken in Cross Lake, Caddo Parish, illustrate the age in years, length in inches and weight in pounds of the big-mouth buffalo:

Age in Years	Length in Inches	Weight in Pounds
4	23	8
7	30	15
9	31	18
9	31	17
12	36	47
14	37	50
14	40	54

In terms of general fisheries, it is interesting to note that our commercial shrimp, the lake shrimp *(Penaeus setiferus)*, requires only one year to attain its maximal size. This species of shrimp lives only one year.

Control of Plants

The control of plants is the most important problem in most of our southern lakes.

The complexity of plant relations to fishing success is certainly comprehended by few sport fishermen.

Broken down, it may here be quite simply stated that plants may make or destroy a fishing lake. Southern conditions profoundly differ from the studies in the state of Wisconsin that have provided for the last 70 years the basis of ideas about lake management. Fundamentally, we, in the deep south, accelerate greatly everything that occurs in the northernmost tier of states. Fish grow at least twice as fast and the whole biological structure of the lake, which is a world in itself, equally speeds up.

The Louisiana lakes fall in a number of quite different patterns. Plant control is often actually the key of fishing lake success.

First of all, it must be stated that "moss" is an absolutely meaningless word involving almost everything that is green and that grows under water.

However, Louisiana lake plant problems may be resolved into certain broad classes.

The plants that make a good fishing lake are not the plants that create a fine duck lake. There is, for example, an easily identifiable plant, the water shield (it can be immediately identified because of its bright olive green upper color and brilliant color of the undersurface of the leaves and the stems, the absence of any cleft, the floating leaf is entire; all these submerged parts, undersurface of leaves, stems and the long "runners" are covered with a completely transparent coating of "jelly") which is an absolutely worthless fishing lake plant but is one of the desirable plants for a waterfowl lake.

Here are enumerated some of the most easily identifiable water plants that concern Louisiana fishermen.

One of the commonest of the emergent (above water) plants is the American lotus. Not really a lotus and actually a native of North America, this plant when it first grows emerges above the water, later rests on the water and can be instantly identified because of the fact that the floating leaves are covered with a natural wax that causes water drops falling upon these leaves to appear like brilliant mercury. Wide in range, the weeds of the plant were formerly ground up to provide a highly nutritious meal. These seeds are contained in a peculiar structure that looks like the head of a garden watering can. This is a dangerous plant. In the latitude of Florence, Alabama, it has been known to produce from one single individual a circular patch 160 feet in diameter. Fortunately, this plant can now be easily controlled by methods, two of which are below indicated.

American lotus contributes nothing to wildlife values. Ducks do not eat its nutritious seeds, fish derive nothing from it. This species can be damaging to the usefulness by wind-agitated wave action, bringing the amount of dissolved oxygen present in the water to such a low level that the fish in the entire lake may perish.

Lotus can be completely controlled chemically or by cutting. Where lotus occurs in a lake, cutting should be done during the months of June and July. The plant should be permitted to develop and to blossom. When the typical "watering can" seed-containing structures are growing but the seeds not yet fully developed the plant should be cut and dragged to shore to die. Any of the very many 2, 4-D formulations can be used as a substitute for mechanical cutting. Two amazing attributes of the American lotus seed should here, perhaps, be stated. Cautiously ascertained age of a closely related Chinese species (distinguishable only by specialists) retained for over a century the ability of the seeds to germinate. Second, unlike so many other aquatic plant seeds, those of American lotus possess in their composition the necessary available oxygen so that they can germinate in completely stagnant water.

Lotus is a magnificant and dangerous plant. Its control should be systematically undertaken.

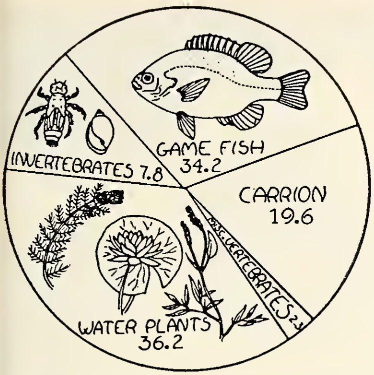
Underwater are many other dangerous plants, useful when few, destructive when abundant. The following brief enumeration indicates some of these. All of them are meaninglessly referred to as "water moss." Illustrations of some of them are shown.

Turtles as Predators

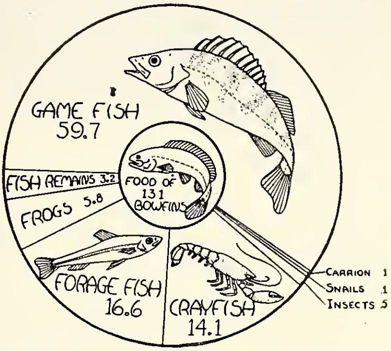
Turtles, on the hole, provide a somewhat controversial subject, but anyone who, like the writer, has seen them stacked five deep on emergent logs sunning themselves realizes that some control measures for the reduction of their populations must be carried out. Specifications for various types of turtle traps will be gladly furnished on request.

The role that turtles play as predators can be extremely important, the actual damage or good that various types of turtles do require local evaluation.

Turtles can perform a good office by eating up dead fish and performing other scavenger duties, thus preventing pollution and subsequent oxygen depletion. However, some species notably subsist directly on living fish. One of these is the snapping turtle.



Graphic analysis of the food of one hundred and eighty-six Common Snapping Turtles. Note the high destruction of game fish (over one-third of total food). (After Lagler).



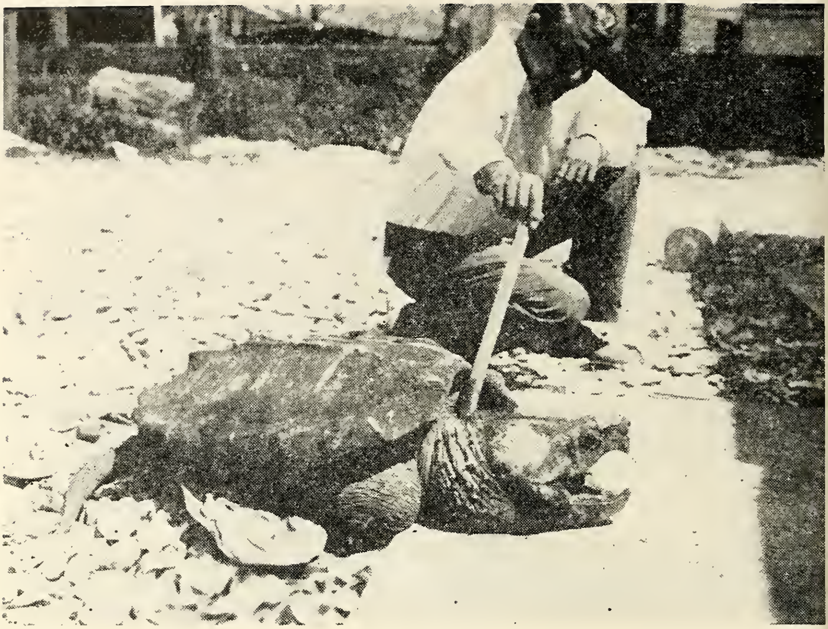
Explanatory of one useful graphic method whereby food habits of fishes can be represented is the above illustration based upon the examination of one hundred and thirty-one specimens of Bowfin, which we in Louisiana know best as the Choupique. The circle is divided quantitatively to show component parts of elements of the Bowfin's average diet. Thus at a glance can be estimated the place of the Bowfin in nature. (After Lagler).

As shown in the accompanying illustration based on the work of Dr. Lagler (Lagler, 1940), it can be observed that the common snapping turtle (*Chelydra serpentina serpentina*) has been known to consume as much as 34.2 per cent of its diet in game fish.

The common snapping turtle usually weighs from 15 to 30 pounds, but one swill barrel fattened individual attained the astonishing size of 86 pounds.

The alligator snapping turtle (*Macrochelys temminckii*) is the largest fresh water turtle of the whole United States. It has been known to attain a weight of 219 pounds. It is an extremely dangerous predator.

Soft-shelled turtles occur throughout the entire United States and much of Canada. They are extremely destructive to fish and often abundant in our Louisiana lakes. They are immediately identifiable because of the absence of any hard shell, which is replaced by soft shell both above and below, and by their odd, elongated needle-like snout. They are extremely active and can weigh as much as 38 pounds. The writer has found them in immense abundance in the Ouachita River near Monroe during the months of June and July, at which time the young were about the size of 25-cent pieces. They are highly destructive and, at the same time, are valuable as food. The writer was sur-



This specimen of the alligator snapping turtle (**Macrochelys temminckii**) was captured in April, 1952, when it was unearthed at the bottom of a drainage ditch by the operation of a dragline at Poydras. The alligator snapper, the largest American fresh water turtle, has been known to reach a weight of 219 pounds, whereas the common snapping turtle (**Chelydra serpentina serpentina**), usually only 15 to 30 pounds, has a record of 86 pounds.

prised to learn during a dinner at Antoine's that soft-shelled turtles served there did not come from Louisiana, where they are abundant (and usually ignored), but were imported from Wisconsin and Michigan. Unlike the other turtles used in useful food, this one is prepared shell and all.

Special Lake Management Problems

It is obvious that many important aspects of lake management can be given space here only for reference to them. The writer will gladly provide on request additional references to books and persons providing special information. These particular aspects of lake management are here mentioned because sport fishermen, unfamiliar with basic biological principles, often underestimate or exaggerate their importance.

1. *Electric Screens and Fish Ladders*

Sportsmen who fish impounded waters are almost invariably alarmed when they see, not hundreds, but literally thousands of fishes of all sizes pour over a spillway.

Unless informed, they believe that this represents a complete loss. Summed up, this is not necessarily the case. Usually, it is more profitably to spend money in improving the conditions in the lake itself or providing breeding sanctuary areas in the lake than it is to spend too great a portion of the budget in preventing the outflow of fish in the lake.

Compactly stated, there are exceptional circumstances under which this loss of fish is of importance. Usually, however, this outflow of fish may be in practical terms disregarded. The reason for this is simple. A well managed lake will support its productive capacity of fish whether such loss occurs or does not occur. There exists, however, three situations where some useful measures may be undertaken: first, where the lake is relatively sterile in production of young fish, the problem then becomes one of the balance between improving reproductive capacity of the lake or saving the outgoing fish; second, where the outflow of the young or adult food ("forage") species exceeds the production of the lake; and, third, where the spillway of the artificial lake presents a barrier against the ascent of the breeding adults of game fish into the area. Only briefest possible comments are possible in this space. These comments follow in corresponding consecutive order.

First, if the lake is under any reasonable control, investment of funds in improving fish spawning and fish growth in the lake is more useful than barring the escape of fish. Two common methods of holding fish back from crossing over a spillway are available. One is use of an electric screen. This highly effective device involves the establishment of an electrical field emanating from submerged metal rods which "shock" the fish into turning back. This method, indispensable in such engineering situations as screening off under certain circumstances the intake of municipal water supply, is highly expensive and for ordinary lake management not feasible. Thus, in one lake that the writer studied the cost of such an installation of an electric screen was in excess of $13,000, a sum that could greatly better be invested in improving specific lake areas.

The second device is the use of screens. The effectiveness of this procedure depends entirely upon the flowage and configuration of the lake. The great trouble here is the contriving of a fish screen that can be serviced practically so that no jam up of debris will occur with subsequent often damaging rise in lake level or subsequent complete loss of the screening structures.

The third situation involves not only biology but public relations. The general situation is that in Louisiana except under special circumstances fish ladders are not needed because the long spawning season and rapid and long growing season if fishes in our latitude will usually sustain to its supporting capacity the fishing pressure of the lake.

The fact does remain that in spawning season many species of our game fish press upstream and, blocked by spillways, congregate below that particular lake. The site of successful fishing below the spillway and the absence of immediate successful fishing above the spillway naturally arouses the interest of sportsmen. Long and extensive research in the unique chain of water impoundments that form the lakes of the Tennessee Valley Authority confirm the general principle (that involves some of our most important Louisiana freshwater game fish) that fish do congregate below spillways in response to stream influence.

A great deal of work has been done on fish ladders. Essentially, fish ladders are engineering well devised structures where, through the spillway itself, can continue to overflow, but the fish, through a different channel, can respond to their natural stimulus of downward current and by-pass the splilway barrie r.

Designs of fish ladders are many and their choice must be adjusted to the specific situation. The writer will be glad to discuss this matter on request with any persons who are interested.

The cost of these structures is little. Provided with the easily available general specifications, they can be readily tailored to requirement.

Lake management problems exist wherein fish ladder construction could be probably of considerable practical biological value and certainly of high public relations usefulness. This, the reader must remember, is in Louisiana, a state where due to its extraordinarily small altitudinal differences and water level differences, fish ladders would seem to be unnecessary.

Fertilization

Fertilization is the name given in lake management to a procedure whereby the waters of the lake are artifically enriched so that they produce abnormal abundance of minute plant life, thus screening out the penetration of light and, as a consequence, delaying or effectively eliminating the growth of certain undesirable submerged plants.

It is particularly in the deep south that these techinques have been most notably developed and most eminently successful. The available reported researces in this field are extensive and of highest practical usefulness. Again, it must be remembered that each lake presents specific problems. Some lakes suffer from natural over-abundance of fertilizing materials. Addition of more fertilizers would more completely damage that lake. Pre-eminent are the fine and so extensive investigations of Swingle and his associates in Alabama. Application of such chemical weed destroyers as 2, 4-D (dichlorophenoxyacetic acid), so effective in attacking and destroying emerged plants, are useless in controlling submerged plants. The fertilization technique remains one of the most effective measures in appropriate areas for such purposes.

The writer will be very glad indeed to provide specific information conerning the amount, chemical characteristics and frequency of application of these fertilizers in controlling objectionable underwater plants. Certain details, chiefly area and estimated cubic volume of the wtaer in the pond plus estimated flowage where the pond is not self-contained, are required.

Fertilizers fall into two general categories: "organic" (cottonseen meal and dry sheep manure are the ones used) and "commercial."

Initial procedures are based upon the surface rather than depth (because of the factor of light penetration). The following indicated general recommendations are herewith provided. Because of their present fluctuation in availability, the two mentioned organic fertilizers are included. The third organic fertilizer, soybean meal, is omitted.

The two discussed organic fertilizers should be applied as here given: First, cottonseed meal, 50 lbs. per acre every week for the first 7 weeks, every 2 weeks thereafter. A total of 14 applications will be used in soft or moderately hard water. Second, dry sheep manure (this is composed of a combination of dry sheep manure one part and of 16 per cent super-phosphate one part), 50 lbs. per acre should be applied every week for 7 weeks and a total of 14 applications used in soft or moderately hard water.

Commercial fertilizers are evaluated and sold on the basic of their nitrogen-phosphorus-potash (potassium) content, this being coded as three hyphenated separated numbers. The cost of commercial fertilizers depends on their constitution.

First, 12-5-5, three applications, 100 lbs. per acre at intervals of 10 days. Apply at monthly intervals thereafter as necessary. This experiment was in hard water.

Second, 8-7-2, apply 130 lbs. per acre each week for 3 weeks and thereafter as long as necessary. This is for soft water.

For the information of the readers, the present F.O.B. New Orleans market quotations are given. Prices will necessarily fluctuate. These are valid for the end of March.

Cottonseed meal	$50.60 a ton
Dry sheep manure—Immediate price not available.	
Commercial fertilizer:	
4-12-4	$40.45 a ton
6-8-8	$58.00 a ton
4-12-8	$44.00 a ton

To secure the correct proportions for pond fertilization use, it will usually be necessary to secure and blend nitrogen-phosphorus-potash proportions to secure the desired mixture. This can easily be done. Usually dealers require a 10 per cent premium in price for the purchase of less than a ton. The fertilizer can be applied many ways, but usually the most practical is to broadcast it from the shoreward side of the body of water, since it is there that most of the objectionable plant growth does need control. Otherwise, it may simply be staked in burlap bags at intervals, or dragged through the water in a burlap bag. Time of application is of extreme importance.

Contrary to general sports fishermen's beliefs, commercial fishing of a sports fishing area, properly controlled, is not only not damaging but highly desirable.

Inevitably, commercial fish, usually designated as coarse fish such as buffalo, gaspergou, catfish and carp, do compete in many ways with the actual fish production of a body of water. Just so much fish production can be supported by any given lake. A high measure of control of the kind in poundage of this fish production can be accomplished. Violently, many sports fishermen oppose such harvesting of coarse fish. This attitude is not sustained by the results of careful, long range and repeated scientific experimentation. It is clear, however, that such harvesting of coarse fish, if it is to profit the interests of the sportsmen, must be conducted under careful supervision, since there is always the possibility of the illegal taking and illegal and all too profitable sale of game fish, game fish that have been produced for the sportsmen's benefit by the expenditure of state money.

Various federal and state agencies have published and distributed, often at no cost and invariably at nominal cost, important illustrated instructive bulletins on the subject of lake management. These provide for the ambitious student a source of expert information far beyond what is elsewhere available.

It must be completely obvious that a lake is not a bathtub. The problems are extraordinarily complex.

An example of the type of observations necessary in analyzing a lake is here given in the instance of Chatham Lake in Jackson Parish. Investigation showed that the primary factor requiring correction was a change in the level of the water. This decision was based upon a survey of the area and an analysis of the plants present and the type and success of sport fishing. The technical information secured provided the basis for the subsequent action which involved the authorization of the construction of the necessary dam, which will bring about the expansion of useful fishing waters and the great increase in the usefulness of a recreational lake serving an important area of the state.

Chatham Lake

Chatham Lake is in Jackson Parish in the town of Chatham. This lake was created by constructing a spillway whose level is at the 163 foot contour (in MGL) across Edwards Creek. A levee 5 feet higher than spillway level was also constructed along the southeastern shore and it is approximately 1,500 feet long. The earth to construct this levee was gotten by excavating from the lake bed. This lake is 8 years old. In the first year of the establishment of Chatham Lake, the levee was washed out at the point where the levee dammed Edwards Creek.

Before the lake was created, part of the land was usd for pasture, part of it was woods, and a very small part was cultivated. Several trees were cut down before the lake filled, but they were not removed. Consequently, there are many stumps, logs and dead trees now in the lake.

The lake at spillway level has an area of 103.4 acres. The length is approximately 0.8 mile long and the average width is ¼ mile. The average depth is approximately 4 feet with the maximum depth of 13 feet in two of the five borrow pits—these

CHATHAM LAKE. Here shown before summer control drawdown exhibits the fringe area which under lake management will become useful fishing waters. (Photograph by Harry E. Schafer, Jr., Louisiana Department of Wild Life and Fisheries.)

pits are the excavations made to construct the levee. There are two small creeks and one large creek that enter into the lake. Two of these are unnamed and the third is Edwards Creek, which has not been known to be dry as it is fed by springs. The smaller inlets dry up in one to seven days after a rain, depending on the amount of rainfall. Surface drainage is mostly from wooded areas, then pasture, followed by a small acreage of cultivated land.

The people could not fish in this because aquatic plants had just about taken over the lake. Of the 130 acres, there was only 10 per cent, or 13 acres, of open water. The remainder was so thick with the plants that it was unable to paddle a boat through them. The following plants were present:

(1) Fanwort (*Cabomba caroliniana*), called moss by many people. It has a three-petal white flower that is emergent.

(2) Buffalo grass (*Potamogeton foliosus*).

(3) Water shield (*Brasenia scheiberi*). This member of the water lily family has an oval leaf with a gelatinous material under the leaf and on the stems.

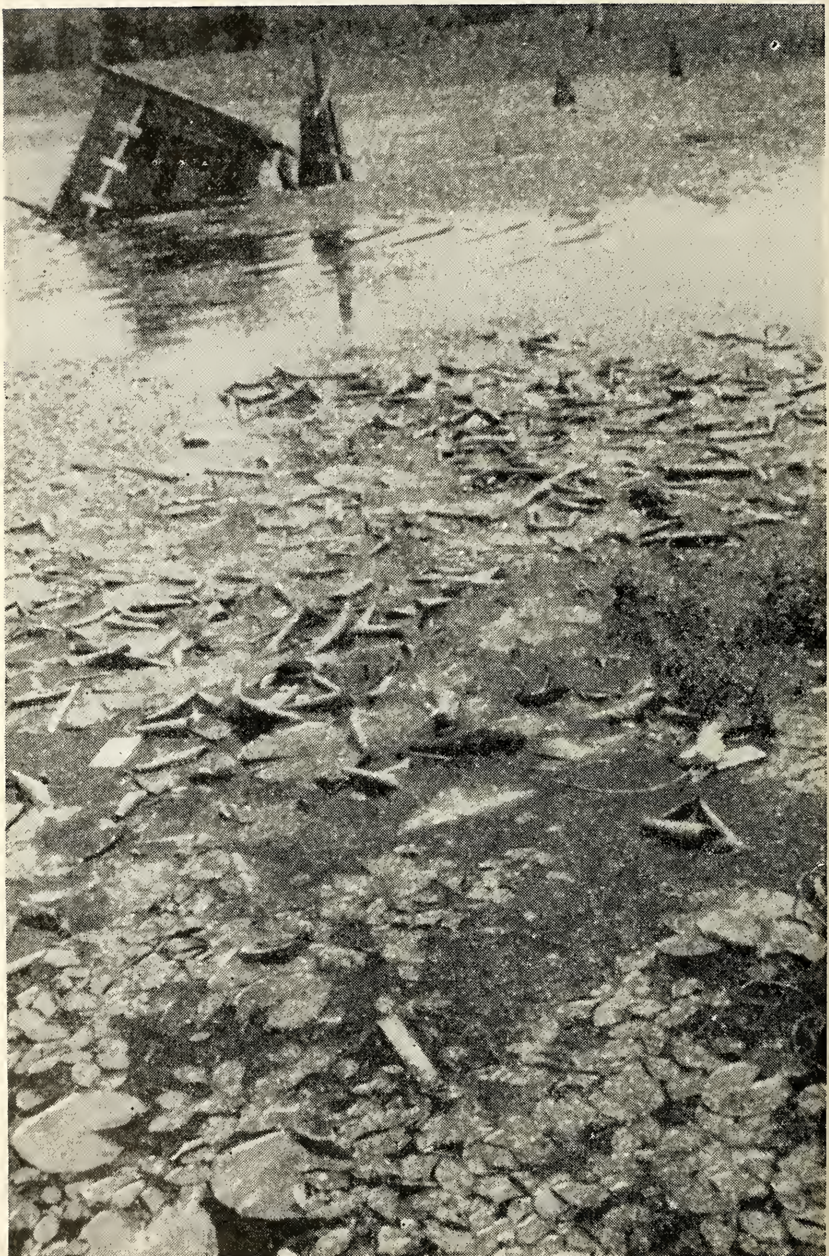
(4) White water lily (*Nymphaea odorata*). It has a round (about 6 inches in diameter) clefted, floating leaf. The white, 3 to 4 inch, flower is emerged.

(5) Parrot's feather (*Myriophyllum humile*). This is another plant that is commonly called "water moss." It is a submerged plant with a bright green shoot emerged in the spring.

(6) Coontail (*Ceratophyllum demersum*). This is a submerged plant that is not rooted and it is also called a moss.

(7) Water hyacinth (*Eichhornia crassipes*). There was just a small patch, about one acre, of these plants in the lake; however, in Edwards Creek and in pits in the woods that are drained by Edwards Creek, there were plenty of these plants. They would move into the lake after each heavy rain.

(8) Cattails (*Typha latifolia*). These plants grow along the shore in shallow water. In Chatham Lake, the aggregated area was approximately 3 acres.



The curled condition of white water lily pads following chemical treatment shows the damage inflicted on these plants. The effects of the chemicals which were not fatal to the plants were supplemented by a summer draw-down which destroyed them. (**Photograph by Harry E. Schafer, Jr., Department of Wild Life and Fisheries.**)

On April 24, 1951, a program of spraying with 2,4-D was undertaken. The solution used was 1 pound of sodium salt of 2,4-dichlorophenoxyacetic acid to 50 gallons of water. One hundred and twenty gallons of this solution was used to spray 1 acre, and a total of 40 acres were sprayed with this solution with the following results:

The *Myriophyllum*, both emerged and submerged, appeared dead two days after a spraying, but a week later new, green, emergent parts were visible again. There was no effect on the *Ceratophyllum, Cabomba* and *Typha.* The water lily and the water shield were affected to the extent that the leaves curled and some of them became yellow. This condition was not a permanent one for the white water lily. The water shield showed the effects of the 2,4-D until the drawn-down three weeks after the spraying. About 95 per cent of the water hyacinth was killed by the spray. The 5 per cent survival was due to the fact that because a farmer's vegetable garden was on the shore where the hyacinths were, some of the plants were missed in exercising spraying precautions.

Hocknoye Underwater Weed Cutter. Here shown during operations at Chatham Lake. This machine is an extremely useful instrument controlling undesirable water plants in lake management operations. **(Photograph by Harry E. Schafer, Jr., Louisiana Department of Wild Life and Fisheries.)**

Simultaneously with the spraying, an underwater cutter was in operation. The Hocknoye cutter was used. It has a mowing blade (the same kind that is used on hay-mowing machines) 6 feet long and the cutting depth is adjustable from zero to 18 inches. This cutter is operated by a crew of two, one member operating the speed of direction of the barge, the other the depth of the blades and preventing clogging with the cut plants. *Myriophyllum* and *Ceratophyllum* cover the blades and braces, cutting down the efficiency of the machine. The barge draws approximately 4 inches of water with both members aboard. This cutter was used to cut paths for the spraying barge, and also for fishing paths.

White water lily and *Brasenia* did not show a regrowth three weeks after being cut. At this time, the draw-down began and the cutter had no apparent effect on *Ceratophyllum, Myriophyllum* and *Cabomba,* as these plants would float back into the area, and the cutters would show a new growth. The *Typha* was too thick for the cutter to cut. Each time that the blade hit the plants, the engine that powered the blade would stall.

On May 14, 1951, 21 days after the spraying and cutting operation, the gate was opened at the spillway for a summer draw-down. The gate is a 3 foot wide opening with boards closing it. Six boards were removed so that the lake level would recede to 6 feet below the spillway level. The time required was approximately five weeks. Once during that time the gate got clogged so that the normal flow was restricted. There was always an overflow at the gate. This draw-down exposed about 75 per cent of the lake bottom.

The fish species known to be present are: blue-gill bream (*Lepomis macrochirus macrochirus*), large-mouth black bass or the "green trout" (*Huro salmoides*), white crappie or white perch (*Pomoxis annuaries*), black crappie or black perch (*Pomoxis nigro-maculatus*), goggle-eyed perch (*Amblophites rupestris*) and bowfin or grindle (*Amia calva*).

This lake, which averages 5 feet, did not have a thermocline in April or May. In June and October, the lake was down 6 feet and it was not stratified. The surface temperature in April before the draw-down was 75° Centigrade. The water temperature at the surface in October while the lake was at the 6 foot draw-down was 84° Fahrenheit. This low temperature was due to the fact that the lake is spring fed and there was always a flow of water.

The surface temperature on April 24, 1951, was 75° F., while at 6 feet off the bottom the temperature was 71° F. and the dissolved oxygen at the 3 foot level was 5.6 parts per million. The Secchi disc reading was 5.5 feet. The surface temperature on May 14, 1951, was 78° F., while at the 6 foot level the temperature was 71.2° F. and the dissolved oxygen was 5.6 parts per million at the 6 foot level. The Secchi disc reading was 5.5 feet. The surface temperature on June 12, 1951, was 80° F. and the temperature at 6 feet was 77° F. The dissolved oxygen at the 3 foot level was 5.2 parts per million. The Secchi disc reading was 5.2 feet. On October 3, 1951, the surface temperature was 84° F. and at the 5 foot level, the temperature was 81.5° F. The dissolved oxygen was 4.4 parts per million at 5 feet.

The Taylor pH indicator slides were used to determine the pH of the water in the lake. In April and May, the pH was 7.0 and in June and October the pH was 7.2. Phenol red was used as an indicator.

Electrocution of Fish

The chief biologist has been considerably concerned with the illegal capture of fish by means of various electrocuting devices.

This method of stunning fish has been utilized for scientific purposes for very many years, originating in Europe some two decades ago. It has been valuable in North America in sampling fish populations without destroying them. The writer has been in close touch with such use of electrical equipment and has observed such operations in various other states including New York, where its application has been particularly extensive. The writer has also had the opportunity of checking and analyzing all of the illegal electrocuting gear captured by departmental agents. The range of this equipment is extreme, involving all types from early Model-T Ford electrical equipment to railroad dispatchers' telephones, army front-line communications outfits and particularly the gear used in the old type of wall telephone.

The biological importance of this type of violation cannot be overemphasized. Using such devices, the careful and costly work of conservation in creating useful game fish habitats and stocking such habitats with carefully secured game fish populations can be wiped out in a matter of hours by violators who stun the fish and market them, both the stunning operation and the marketing procedure being explicit violations of the law.

It should be pointed out by the chief biologist that although formerly many violators thought that such violations were difficult of legal establishment in court, such is not the case. The chief biologist has studied the matter with care and wishes to make clear that in any given instance, provided the necessary information is secured (which is relatively easy on the part of any game agent instructed in the type of evidence necessary), it is quite possible to establish on a legal status the fact that the fish were electrocuted even though devious other explanations may be presented by the defendant.

Illegal Dynamiting of Fish

Although the stunning of fish by means of explosives is sometimes practiced illegally, it happens to be one of the least efficient methods of killing fish, so that even were it legal, it has proven to be impractical as a commercial method. However, it is deadly when used in small bodies of water. It should perhaps be pointed out here that the chief biologist, who has done a great deal of experimental work on the effect of explosives on underwater life, has established that it is perfectly simple to provide the necessary evidence as to the illegal use of explosives wherever such violations occur. The evidence acceptable in any court can clearly establish the cause of death, thereby making such violations all the more hazardous.

A deadly fish poison, the technical name of which is rotenone, is derived from ground-up derris root. This substance happens also to be used in the control of insects. Derris root for commercial purposes is assayed on the actual rotenone content, which averages about 5 per cent. When conditions in lakes become so severe and out of balance that it is necessary in eliminating the "coarse" fish (for example, gar, buffalo or predators) to execute such drastic action that the whole fish population, game and commercial, must be eliminated, this violent technique

CHATHAM LAKE. A chemical-spraying crew shown here with equipment cooperated in the combined underwater weed cutting and chemical treatment employed in reducing water plants objectionable to sport fishermen. (**Photograph by Harry E. Schafer, Jr., Department of Wild Life and Fisheries.**)

has been applied with success. The writer was concerned with some large scale operations. This entails the complete elimination of fish and the adequate restocking of desired fish populations. Both operations are extremely expensive.

It is the purpose of this statement here to deter, if possible, lake owners from entering upon such a program until other devices have been utilized to ascertain the existing facts concerning the specific body of water.

To be precise, the writer had become concerned with an instance of decline in game fish values of the lake, which decline was ascribed to the unbalance of the lake in the direction of commercial fish. It was a Louisiana private lake and it was poisoned at considerable expense, in excess of $4,000. The chief biologist had no information concerning the entire matter until the operation was being executed and he, therefore, participated in it merely as an observer. The facts were that the conclusions by the owner were not correct. The expenditure of only $200 or $300 in an experimental approach to the matter by the use of seining crews would have given a correct basis of estimating the state of this particular lake. The poisoning operations were in complete contradiction to the initial presumed pattern of the fish populations in this body of water. Subsequently, it appeared evident that the impairment of the lake was evidently due to heavy cotton-dusting operations using insecticides that are lethal to fish. It is a matter of fact that so lethal are certain cotton-dusting compounds that in a state adjacent to Louisiana the passage of self-aerating fish rescue and fish transport trucks inhaled in their aerating systems sufficient cotton-dusting chemical compounds to kill the entire fish loads. The chief biologist will be very glad indeed to consult with any owners of private lakes who contemplate such major sweeping operations since a preliminary survey will reveal the true state of game fish to commercial fish relationship and, in the first place, the situation may be quite different from the interpretation, and in the second place, the restoration of the lake to a correct recreational value may be possible through much easier, much less expensive means.

CHATHAM LAKE. Here shown are paths cut by the Hocknoye underwater weed cutter to provide sportsmen with access to fishing areas and also access to weed infestation for chemical treatment. **(Photograph by Harry E. Schafer, Jr., Department of Wild Life and Fisheries.)**

Any person seriously interested in lake management may ask for and receive the following listed special indications of sources of information prepared in mimeographed form by the chief biologist. These lists will be found to be peculiarly useful because, in the first place, lake management in the northern United States and lake management in the deep south are often completely different patterns and, in the second place, many of the most valuable sources of information are almost unknown, even to a deeply interested sportsman or a deeply interested scientist.

1. Cause of death of fish in ponds.
2. Turtle traps.
3. Bibliography of plant control.
4. Control of objectionable plants by fertilization.
5. Control of objectionable plants by water level fluctuation.
6. Control of coarse fish in relation to sports fish.
7. Preparation of fish parasite samples.
8. Preparation of plant samples for study.

FISH BAITS

The problem of maintaining a supply of natural baits is a perennial one with fishermen everywhere. Any means whereby the interested sportsman can streamline his operations between leaving his home and wetting his line is obviously of interest to him.

The writer has received so many requests for information about rearing or maintaining such baits as earthworms and crickets that such data was prepared, published and provided. Since the supply of the publication was quickly exhausted and the requests never ceased, information is here set down for reference purposes.

A supply of earthworms can be insured with a minimum of cost and of care by a number of thoroughly practical procedures which have been carefully worked out and well tested. They are particularly effective in the deep south. Since these methods differ in various details although the end results are parallel and since the fisherman is, if anything, a experimentalist, the following account prepared by the writer is here presented to give the enterprising worm fisherman abundant material for investigation.

A number of different kinds of earthworms exist in Louisiana, both native and imported. Earthworms become peculiarly cosmopolitan since they are transported in the earth of imported plants back and forth throughout all of the regions of the world, thus particularly in subtropical and tropical climates a wide variety may become introduced and acclimated.

Earthworms make use of the widest possible variety of nutrient materials. They can be reared successfully by methods which range from simple, single worm beds capable of supplying the needs of a fisherman to huge "assembly line" "worm factories" such as are needed by zoological gardens for feeding voracious earthworm-eating animals.

Probably most suitable as an introduction to earthworm-growing practices is the following account relating to our common North American earthworm, familiarly seen after heavy rains.

Specimens of *Lumbricus terrestris,* the common earthworm of the United States, must be gathered at night and preferably between 10 and 12 o'clock during or following a drizzling, warm rain when the ground is thoroughly soaked. The worms come to the surface of the ground in large numbers at such times and may be captured easily with the assistance of a strong flashlight or an acetylene lantern. The best collecting grounds are closely cut lawns where the soil is rich.

A widely used and very easy method is one whereby earthworms can under certain circumstances be given an electric shock at night that will drive them to the surface of the ground. Essentially, this apparatus consists of five elements, i.e., a portable battery and two pointed metal rods with a simple device to increase voltage inserted in the circuit. The operator can soon learn the distances apart that under varying conditions of moisture these rods need to be placed. Then, using a flashlight, he can readily locate the worms that have wriggled upward out of the electrical field.

When the worms have been collected they may be left for the remainder of the night in a cool place in a pail containing a small quantity of freshly cut grass. The next morning the worms should be carefully sorted, and all injured or abnormal specimens should be removed. If they are washed and placed, a few at a time, in a dish of water those that are injured may easly be detected.

Earthworms feed very largely on dead and decaying leaves and, like chickens, they digest their food better if there is a certain amount of grit in their diets. We have obtained best results by keeping earthworms in large boxes filled about 12 inches deep with approximately equal parts of old leaves and leaf loam gathered in the woods. Under no conditions should heavy clay soil be used. The worms need no other food, as they feed on the dead leaves. The material should be kept moist but not saturated with water. Unless extreme care was exercised in removing all injured worms, the boxes should be inspected after a week and all dead and dying worms removed. Should it happen that the worms are not keeping well those that are healthy should be removed and placed in a fresh box of leaves and loam.

Earthworms also keep well in very light, loamy soil. If this is used it is often advisable to feed the worms. Bread crumbs or cornmeal make excellent food. The food should be moistened with water, spread sparingly over the top of the soil every two or three weeks and covered with about an inch of loam. Feed sparingly and not too often or the food will spoil and the worms may die.

Avoid trying to keep too many worms in one box. A cubic foot of culture material, after it has settled, will be sufficient for about fifty worms. Cover the boxes with panes of glass and keep cool. Temperatures above 60° F. usually prove fatal.

While cocoons of this earthworm are not easily obtainable, a few of them may usually be found by carefully sorting over the loamy material in the boxes after the worms have been stored in it for a month or so. The young worms emerge from the cocoons in a few weeks and thrive under the same treatment as that given the adults.

Allolobophora foetida is one of our well-known native earthworms that is particularly useful for fishing purposes because of its high activity.

The following are precise directions for rearing this species:

1. Select a shady place in well-drained soil for a bed, say 3 x 6 feet.

2. Dig out a foot or more of soil and fill with well rotted manure.
3. Wet it down throughly and introduce the worms by distributing them over the surface.
4. Cover them with a sprinkling of dirt and allow them time to burrow.
5. Add some pieces of hard stale bread soaked in water and cover these with dirt.
6. Feed the worms once a week by spreading over the surface of the dirt cornmeal, old bread, or vegetable refuse from the kitchen, covering this with dirt each time and adding a layer of straw or gunny-sacking to retain the moisture. Sprinkle the bed with water whenever it shows signs of getting dry.
7. Remove worms for use by turning over surface layer with a hand digging-fork, digging in a new place each time.

Further useful observations by Dobie, Meehan and Washburn will add to the fisherman's knowledge:

"Earthworms can be raised in basements, under heavy shade of trees, or in other cool places. Bait-size worms can be had in 3 months, and the worms mature in 6 months. A tub 2 feet in diamter and 10 inches deep, fully utilized, should produce several thousand bait-size worms a year.

"The different species of earthworms vary in size when full grown. The common earthworm or night crawler reaches a length of 10 inches; the small red species found in manure piles grows only to 3½ inches. The earthworm reared should be of a size suited to the fishing needs of the region.

"A suitable soil is prepared by mixing manure, screened top soil, and peat moss into a fine loam. The peat moss may be replaced by other forms of organic matter such as leaves and hay. Another soil formula calls for dry coffee grounds and loam mixed 50-50. The loam should be well moistened but not soaking wet.

"Almost any type of box is suitable for the culture of earthworms, but small boxes that can be handled easily are to be preferred. The lug boxes in which fruit is sold are excellent. An old tub or a metal drum cut lengthwise is also good. If wooden lugs are used, they should be placed on bricks or blocks to prevent the worms from escaping into the ground. Lugs can be stacked if separated by blocks.

"The worms can be fed chicken mash or a mixture of coffee grounds, dried cracked wheat, and bread crumbs. Feed should be given daily. Another feeding formula is 1 pound of lard mixed with 2 pounds of cornmeal. This should last a month. Ground garbage spread over the surface of the soil makes a good inexpensive food. Care should be taken that the food is in a thin layer or it may heat and destroy the worms.

"The worms can be harvested by emptying the box and sorting out those of suitable size. The loam should be saved and transferred to a fresh box, as it contains the egg capsules which will start a new colony. The unused worms should be returned to the old box as breeders. Egg capsules for starting new boxes can be best obtained by covering the surface of the soil of a breeder box with a mulch of finely crushed dead leaves. If this mulch is kept moist for several weeks, egg capsules will be laid here and will hatch in fourteen to twenty-one days. The mulch and the soil immediately below can be added to new soil to start more boxes.

"Before sale, the worms should be placed in sphagnum moss to 'scour' for three or four days. At the end of this time the worms will be almost transparent but tough and lively. If it is necessary to leave them a week or longer in the moss, a little fresh milk should be poured over them at intervals of a week. The moss should be rinsed every ten days. A good way to carry the worms on the lake is to place them in a sugar-sack full of damp moss. The sack should be dampened whenever necessary during the day."

The writer has found that the breeding receptacles if held in garages must be protected from attack by marauding ants. This can easily be done by scattering insecticide powder over the adjacent area of the floor where the worms are being reared. No insecticide must be permitted to enter the worm beds.

Dr. Christopher William Coates, curator and chief aquarist of the New York Zoological Society aquarium, in providing the vast numbers of earthworms needed in feeding the delicate platypuses in captivity, there set up an earthworm enterprise that was entirely adequate and which consisted of pits constructed of concrete floors and cinder-block walls. The latter are very important since they provide for the seepage of excess water while keeping the worms and soil from escaping. The proper amount of moisture is of course a vital factor in raising earthworms; they should be damp at all times but never waterlogged. Temperature, too, is important. Earthworms do not thrive at temperatures much below 65° and above 75° F.

He further states: Brandlings, manure worms, or soilution worms, which are all the same thing, we turned out by the million on a diet of junk—restaurant scraps, coffee grounds, decayed fruit, condensed·milk, Pablum, cornmeal—almost anything, including old newspapers and clothing, mixed with any old soil, manure, and straw, kept moist at a temperature of 66° F.

"The English garden worm seems to do best on simple soil and leaf mold, mixed with handsful of grass cuttings.

"Night crawlers will live on a food mixture similar to that provided the garden worm. They take a great while to mature, however, and rarely breed in captivity, so that while they have bred here, we do not consider this particular part of our venture successful."

It may astound many readers to learn that there actually exist in the world earthworms that might well have come out of a nightmare. These extraordinary worms all belong to the family *Perichaetidae*, and the giant species among them occur in widely scattered, highly separate areas including Australia, Africa, South and Central America. It is hard to imagine, but is definitely true, that some species of *Perichaetidae* attain the individual size of 11 feet in length and thickness of a sausage.

Crickets have a peculiar popularity in certain sections of Louisiana, where the enterprise of catching and selling them provides income for many small boys. Crickets can be held and reared in garbage cans, as set forth by Dobie, Meehan and Washburn. They recommend waxing the inside of the can for the top 6 inches to keep the crickets from climbing out. A layer of clean sand kept moist and covered with wood excelsior for protection and roosting space will provide a good substratum for egg-laying operations. Poultry laying mash is recommended, but uncooked oatmeal is also satisfactory. The writers state that the food should be placed in a small pan or saucer and that about 2 pounds is required to produce one hundred crickets. A quart fruit jar drinking fountain provided with cotton in the watering can (to keep the young crickets from drowning) can be used.

It is recommended that thirty adult crickets, half male and half female, be used as a complement of a single garbage can. The female can be identified readily by the long, egg-laying tube in the tip of the abdomen. They found that a single 24 inch can produced 400 crickets in three months. Adults are distinguishable by their development of wings. These authors recommend the use of insect powder on the floor outside of the can to prevent forays by ants, which are highly destructive of crickets. Where spiders or other possible predators are present, screening of the can will be necessary. Temperatures of 80° to 90° F. are best.

The widely distributed catalpa worm (it occurs from Illinois to Louisiana) is the larva of one of the sphinx moths, its technical name being *Ceratomia catalpa.* Very prolific (they can lay as many as 1,000 eggs in a single mass), the catalpa caterpillars hatch in about two weeks, feed only on the catalpa tree foliage and attain a length of about 3 inches. They are excellent bait for many panfish. When grown, they move down the tree trunks into loose soil and there transform in the then moth stage. Two generations can be produced in a year—the first in spring, the second in late summer or early autumn.

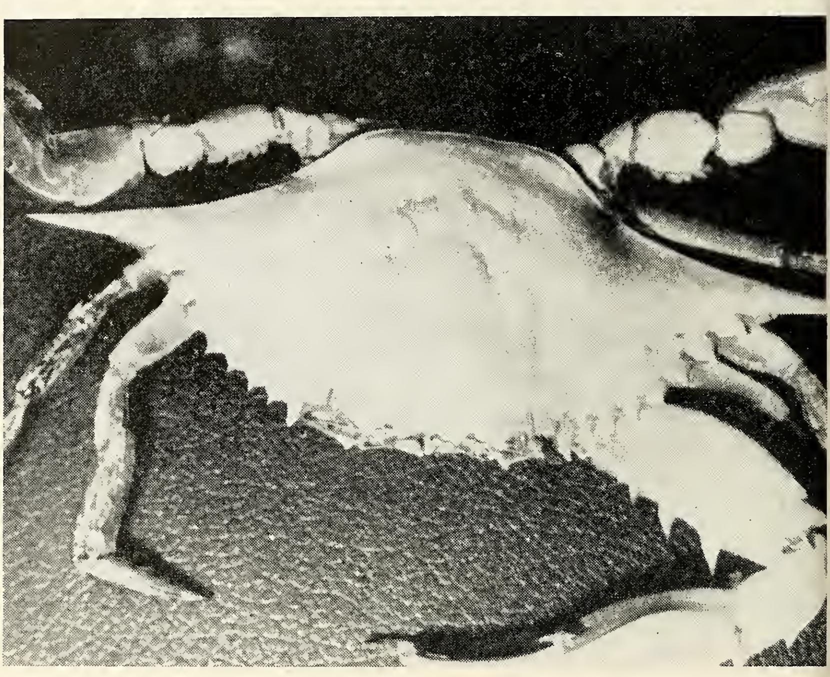
It is evidently possible that a large income can be obtained by providing bait for fishermen.

The priority is minnows, fish worms and crickets, and it is the purpose of this brief statement to set down something concerning these demands. The rearing, maintenance and successful subsequent selling of minnows obviously establishes the success or failure of any minnow enterprise.

The fact remains that there does exist an urgent need for minnows which can be provided with immense profit in Louisiana as everywhere else in the remaining forty-seven states.

The capture, the transportation, the holding and, particularly, the breeding of minnows are problems too greatly complicated to be set down in any brief statement.

Information concerning minnows as bait is available and will be gladly provided in mimeographed form so that persons interested can gain access to sources wherefrom they can become familiar with what are regarded as the best known present procedures.



ALBINO BLUE CRAB. This is a photograph of the rarest blue crab that has ever been known. It is a unique individual taken by a Department of Wild Life and Fisheries agent, Willie Schaubhut, Bayou Des Allemands, in June, 1950. It was completely white and would have been dangerously conspicuous to all of its enemies.

Although the blue crab fishery has been under investigation for the last eighty years, throughout the entire Atlantic and Gulf Coasts, all the way from Nova Scotia to the Mexican border, of the untold billions of crabs that have come under scientific observation in the course of these researches, this is the only albino that has ever been discovered.

THE LOUISIANA CRAB FISHERY

Broad changes that have occurred in the Louisiana coastal areas have had a heavy and damaging impact upon some of our valuable aquatic and seafood resources. These arise for example, from the constant lowering of the level of the water table through drainage operations, operations involving flood control and the influence of constantly rising demands for water supply with increasing population and industrial developments.

Many of these activities are inevitable, but the fact remains they have often resulted in a decrease either of available fishing areas or of available food crops.

Such an operation as the construction of the Atchafalaya Floodway, leading from the Morganza Spillway to the Gulf of Mexico, completely alters the pattern of many forms of fresh water and seafood habitat.

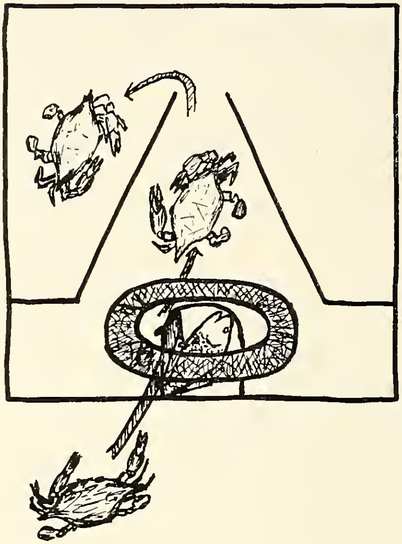
Coincidentally with the blocking off of natural drainage, severe and sometimes completely disastrous decrease has been found in the availability of formerly abundant local fisheries. The chain of events whereby the changes in drainage finally express themselves in the fishermen's yield is complicated and sometimes obscure, but the interference with drainage and the loss in fisheries do occur concurrently in time and space. Sometimes the decline in a local fishery may be catastrophic. The writer has had brought to his attention such an example in the case of the crab fisheries of the area above Morgan City. Some idea of the disastrous degree of decline may be indicated by the fact that one local company which produced 8,849 pounds of crabs in August, 1950, produced only 941 pounds in July, 1951, and only 32 pounds in August, 1951.

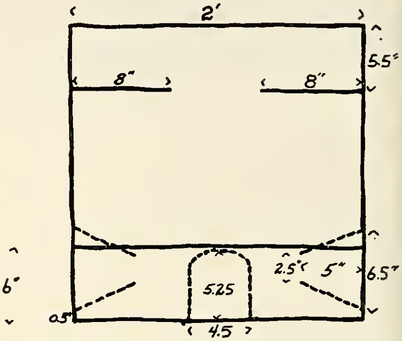
Crab production is enormous in Louisiana, rising in a period of fifty years from one-half million to over ten million pounds per annum. It is obvious that any improvement in the method of catching crabs becomes correspondingly the more valuable as the available stock declines, provided such methods are in accord with good conservation policy.

It is for this reason that there is here given a more extended account of certain crab-fishing methods used elsewhere in the United States but unknown in Louisiana, which methods not only are more efficient and capture larger quantities of crabs of legal size, but also have the merit of conserving both the crab stock and inflicting the least possible damage on the crab environment. Previous mention which had been made by the writer of these methods have evoked a flood of inquiry for specifications and it is for this reason that there is here given a compact account of the equipment employed.

The three categories of crab-catching equipment highly desirable for use in Louisiana are: first, a crab pot; second, a more or less automatic method of running a trotline; and, third, the use of a "crab scraper" to harvest soft shell crabs.

Descriptions of each of these herewith follows:



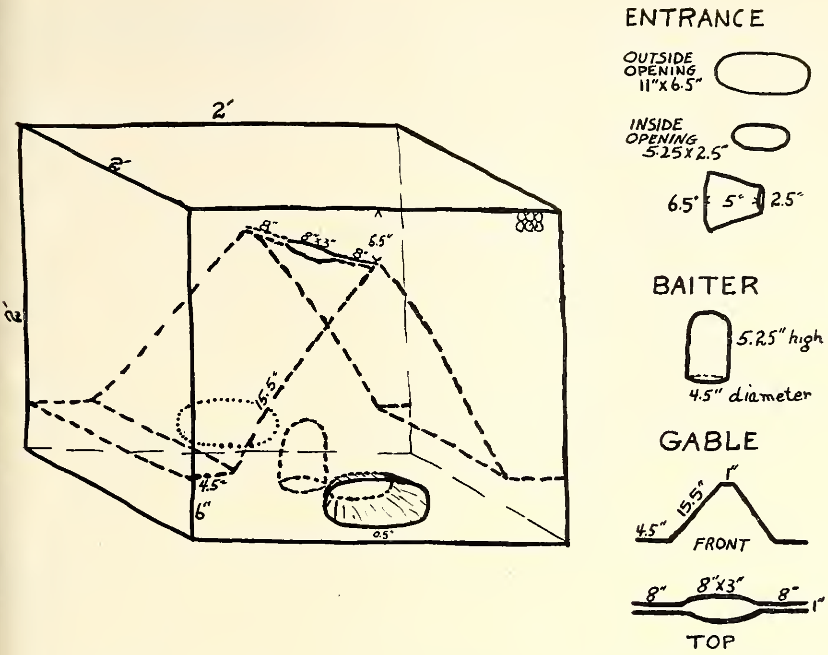


CRAB POT. Elevation of two-entrance model from one of the closed sides showing dimensions of upper compartment floor and central exist from lower to upper chamber, lateral funnel entrances and central bait compartment.

TWO-ENTRANCE CRAB POT. Elevation from one of the entrance sides showing the path followed by trapped crabs. The ringlike structure indicated represents the entrance funnel beyond which can be seen the big compartment containing a bait, menhaden. When in the upper chamber, the crab, unable to escape, awaits removal.

Crab Pot

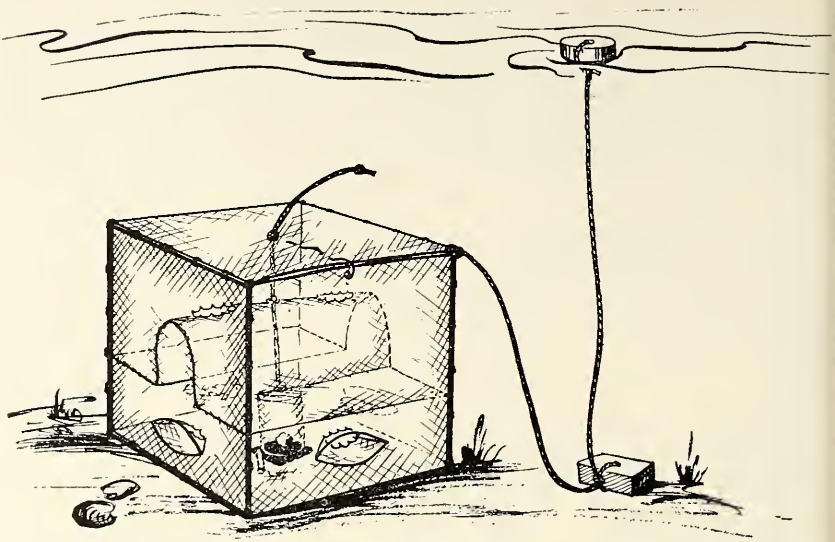
The crab pot is essentially the modification of the traditional lobster pot used for centuries in capturing the northern lobster. It has been used with extreme success on the East Coast, where it is standard gear, but has never been used in any other than an experimental manner in Louisiana waters, although it is, in the writer's opinion, one of the most efficient methods that could be used by a small operator. It has the commendation of conservation authorities wherever it is employed, since it holds the captured crabs without harm and permits the release of undersized individuals. It has the further merit of being inexpensive (capable of being easily constructed by any proficient fisherman



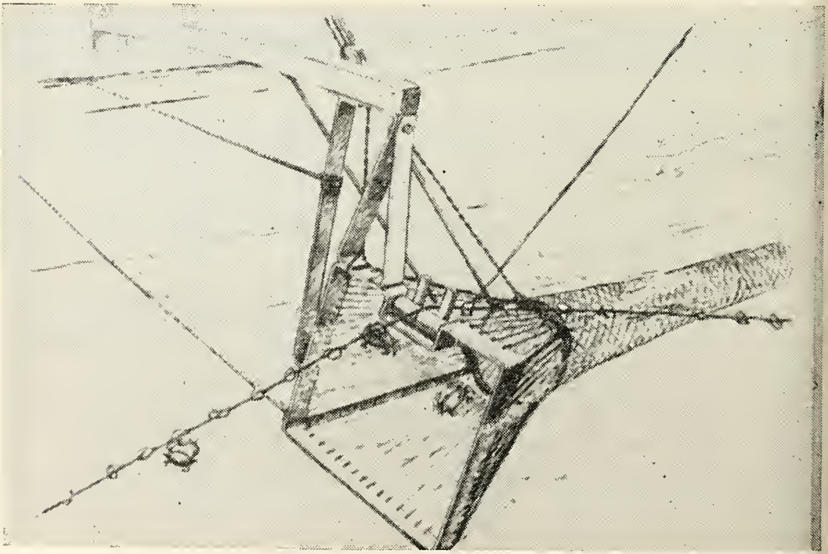
CRAB POT. This is two-entrance model crab pot showing details of construction. The modification into a four-entrance type is indicated in another illustration. **(Original drawing by Harry E. Schafer, Jr., Louisiana Department of Wild Life and Fisheries.)**

himself) and capable of inexpensive maintenance care. The crab pot is designed on the basis of normal crab behavior.

Crabs are extremely energetic bottom feeders. Once they locate food, they are extremely persistent in their activities directed toward reaching that food. Crabs in this are broadly unlike finfish for the capture of which in traps such as pound traps, long directing baffles are necessary to guide the prey into the definitive enclosure. The crab pot offers the crabs only two relatively small entrance apertures, but experience shows that these are adequate. Once the crabs have passed the funnel and have found their efforts to close in on the bait are not successful, they follow their normal reaction of rising. Here they encounter this time a single small aperture and emerge into the upper chamber of the trap which is provided with a gabled floor. There, unharmed, they remain and can easily be removed. The specifications of construction of the trap are here given since



FOUR-ENTRANCE MODEL OF EFFICIENT CRAB POT. Here attached to the buoy line at only one corner, this crab pot set utilizes a brick anchor. The lifting line is attached to a bridle tied to opposite corners of the pot. Where currents are swift, an anchor (brick, concrete or pieces of iron) is attached to opposite corners of the crab pot under the bridle. **(After Andrews.)**



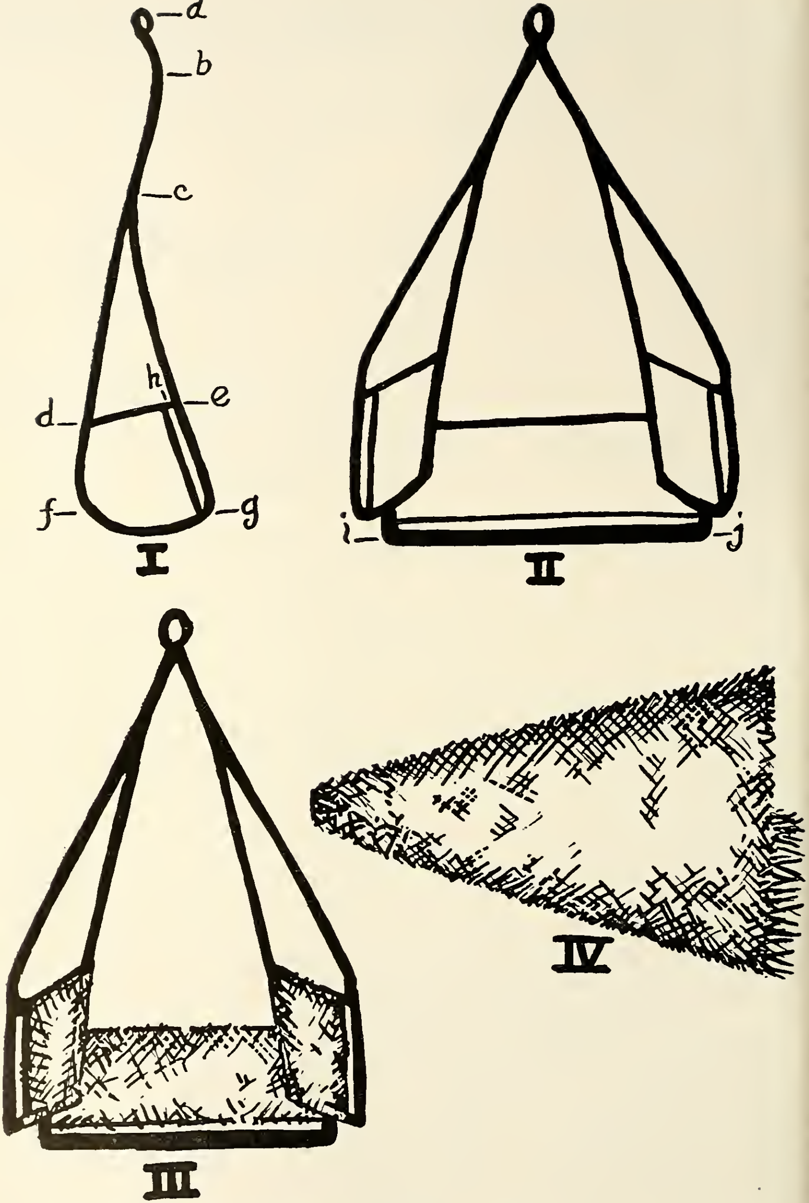
Automatic Crab Trotline Dip Net—Here are shown in detail the single horizontal and double vertical rollers. The crab trotline passes first over the horizontal roller and then between the vertical rollers. The crabs drop into the square basket-like funnel shown below the rollers. (After McHugh.)

the measurements indicated have been arrived at as the result of long practical experience. The degree of reinforcement of the trap by incorporating a heavy wire frame into the construction of the bottom of the trap or of the whole trap depends upon the load of catch to be lifted, which in turn depends upon the frequency with which the trap is serviced and the abundance of crabs present.

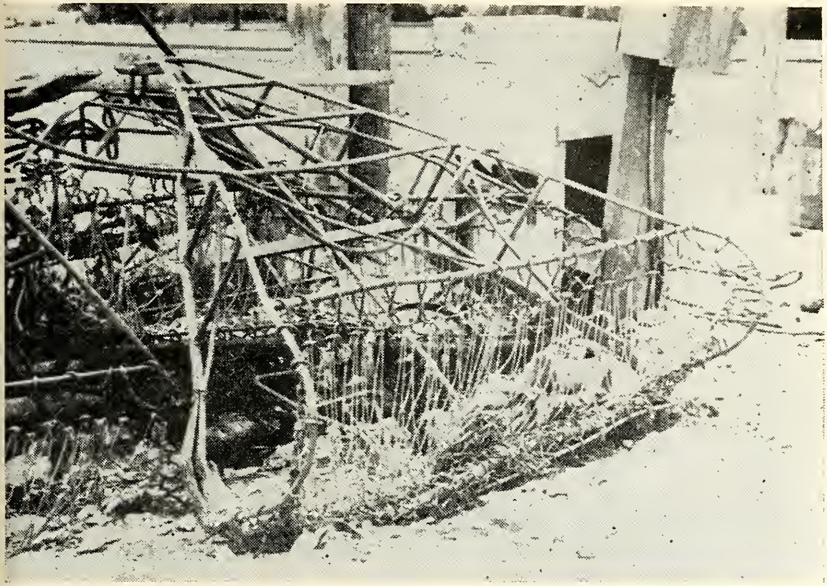
The crab pot is a cube 2 feet by 2 feet by 2 feet, constructed of 1½ inch mesh chicken wire. There are two entrances opposite each other, each at one end of the tentlike internal partition that separates the lower chamber of the pot from the upper chamber. Each entrance is 1½ inches above the base of the trap and measures 11 inches horizontally and 6½ inches vertically. Inside each entrance is a funnel of the same chicken wire 5 inches long and decreasing in size from the 11 x 6½ inch entrance dimensions to an inside funnel exit 5½ x 2½ inches.

The bait compartment, which is attached in the center of the crab pot floor, is a vertical cylinder 4½ inches in diameter, 5¼ inches high and having a rounded top. Access to the bait compartment is afforded by cutting a wire flap in the floor of the pot, which serves as an easily closed door. The internal partition of the pot follows the form of a gabled tent. It is attached to the pot walls 6 inches from the base of the pot, then forms a horizontzal 4½ inch shelf from which it proceeds at an angle of 45°, 15½ inches on each side, but the two sides do not meet at an angle but meet in such a manner that they form a cut-off 1 inch wide forming a horizontal crest. This crest carries the exit into the upper pot chamber. This exit, which is centrally placed, measures 8 inches longitudinally and 3 inches laterally, thus leaving on each side of it a closed flat 8 inch section of crest. Through this aperture, the crabs pass into the holding chamber.

Access to the pot is provided by a simple construction whereby one of the lateral edges of the trap, an edge parallel to the axis of the internal partition, is not fastened but is finished off so that it can be pressed aside and provide for the removal of the catch. The pots must be provided with necessary line and cork buoys so that they may be readily recovered. The lifting line can be attached singly (or as is usually necessary) bridled to the corners of the pot to prevent damage when the weight of the catch is such that the structure would otherwise be distorted.



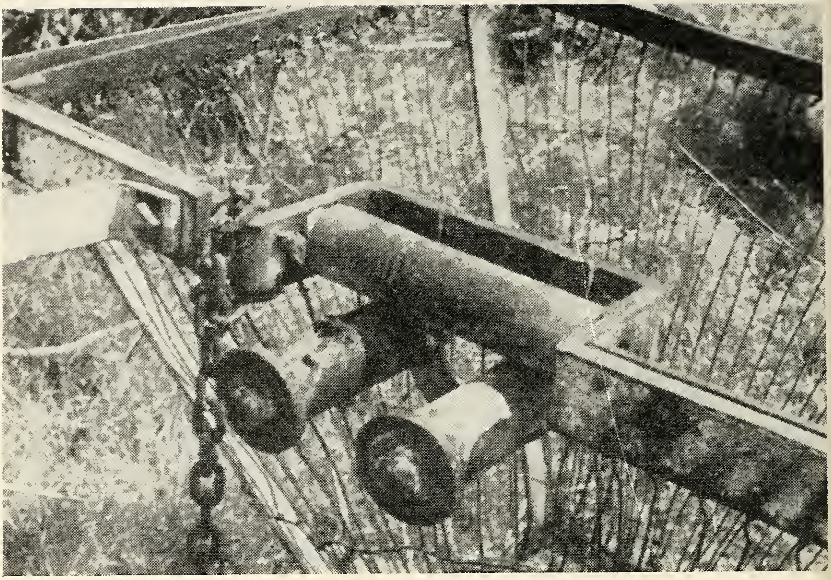
SCRAPE FOR TAKING SOFTSHELL CRABS. This highly efficient equipment is used for securing softshell crabs by dragging it over a "grassy" area. Crabs, when shedding, seek the shelter of such grass and congregate there, often, in large numbers. The equipment serves two excellent purposes; first, it rolls the softshell crabs in the detached grass without damaging them: second, scrape "cultivates" the vegetation by tearing out dead or dying plants.



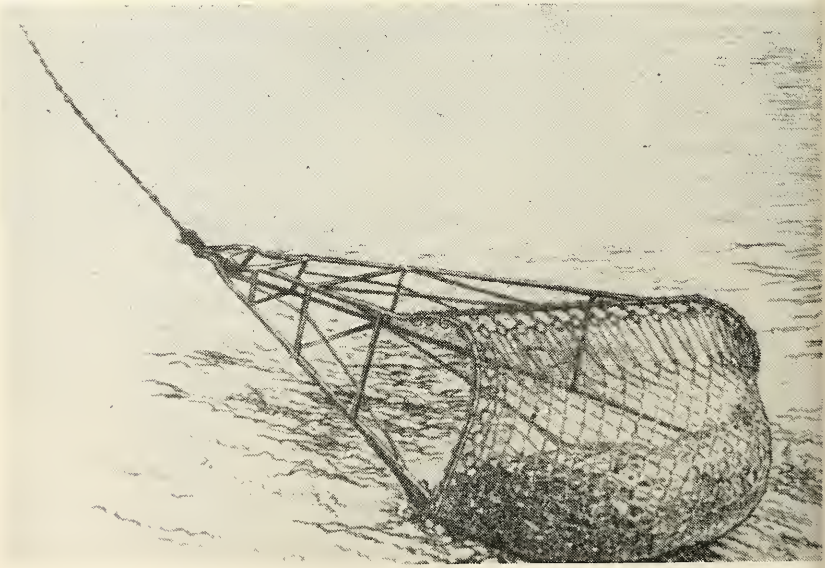
This view of Scrapers for soft shell crabs shows how the delicate animals are protectively wrapped up in the Turtle Grass and other undersea vegetation in which they seek shelter to shed. (After McHugh).

The second crab fishing technique concerns the method of making the removal of the crabs from the trotline practically automatic. A legal construction is illustrated in one of the accompanying figures, in the use of which the trotline is passed over a roller between two vertical posts and the crabs which have attached themselves to the bait are knocked off into the indicated apparatus so that they are caught in the mouth of a rectangular funnel-shaped net and are swept backward by the motion of the boat into an attached long, cylindrical following net, from which they are recovered at appropriate intervals. General arrangements can be then understood from the illustrated diagram.

The third special apparatus is designed for the capture of soft-shell crabs on a more productive basis than the usual methods employed in most localities in Louisiana. Responding to the changes that occur preliminary to shedding, the crabs instinctively move into shelter, which may consist of beds of turtle grass or other subaquatic vegetation, where they moult and remain until the new shell secreted in fluid form has had time to harden. The crabs at the same time imbibe water and



The roller and bracket type of crab trotline apparatus. The line is threaded over a horizontal and two vertical rollers. As the crabs clinging to the bait strike the roller, they drop into the funnel section of the "automatic dip net" and pass backward into the bag section. They are removed at intervals by simply untying the "cod-end" of the bag. The gear is towed so that the horizontal roller is just at the surface of the water. **(After McHugh.)**



A Crab Scraper or Dredge utilized for capturing soft shell crabs in typical grassy "shedding" areas. The gear rolls the crabs up unharmed in the dead grass, thereby also cultivating and improving the growth of the necessary underwater plant life. (After McHugh.)

within a matter of only several minutes may increase their width by as much as 20 per cent. It is by taking advantage of this that the Louisiana crab fisherman invented an ingenious and highly efficient method of catching soft shell crabs. This consisted simply of tying together bundles of brush which were then submerged in appropriate crab waters, visited at intervals, and the crabs which had sought shelter in them for the purpose of shedding were captured, examined, sorted and marketed. The method for the casual and amateur soft shell crabber was a search of turtle grass beds, the shedding crabs being taken with a dip net.

The use of the crab scraper has the tremendous advantage of, first, its efficiency in capturing the crabs; second, lack of damage to the crabs themselves since by its operation they are rolled up in the turtle grass and the undersized individuals can be released unharmed; and, third, the fact that the scraper in passing over the beds of vegetation automatically removes the dead plants and thus cultivates the beds.

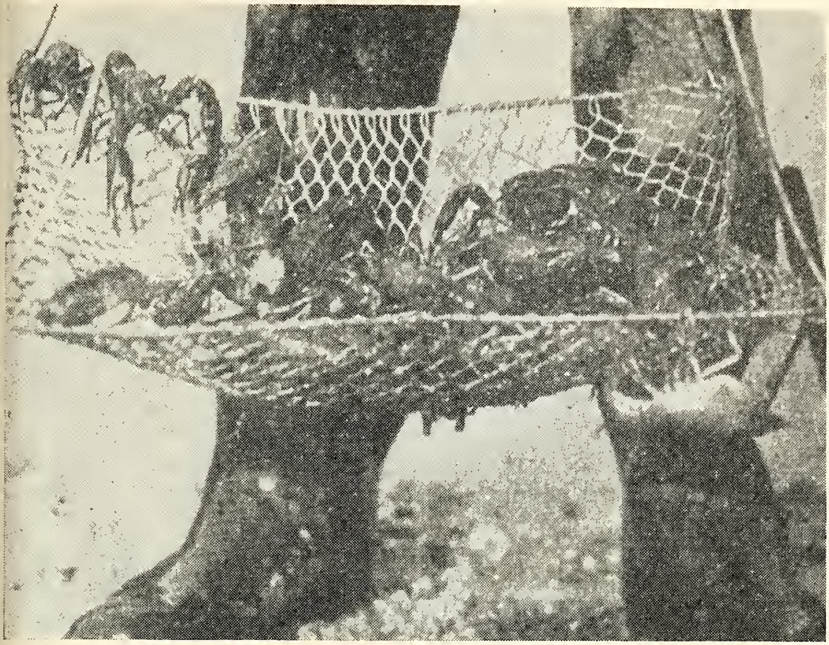
The fishermen have further modified the crab pot by constructing four instead of two entrances, each entrance being placed in the similar position on each side of the pot.

Fishermen operating crab pots either set them individually in a long line or in a series of short lines parallel to each other about 100 feet apart. The crab pots are successful in depths of 1 to 10 fathoms. Fishermen usually operate crab pot lines as a crew of two, using a 35 to 40 foot boat, but the fishing could be carried out by one man. Some states where crab pots are used impose a limit of 50 crab pots for each fishing unit but, as a matter of fact, 75 pots could be easily handled where such restrictions are unnecessary for conservation reasons. The operators usually fish their crab pots once a day, early in the morning, and ordinarily finish their work shortly after daybreak, since lifting the crab pots occupies only 2 to 3 hours. The crab pots must be re-baited every day. One 150-foot roll of 24-inch wide chicken wire will make 9 crab pots. Further additional remarks are of value in indicating the details of this type of crab catching operation. Iron rod frames are sometimes used, extended around all the edges of the pot to insure preserving the shape. These, however, may be entirely omitted. Frequently, some concrete pourings, concrete or incidental sections of pipe are tied to opposite corners of the bottom of the pot to prevent its being overturned by currents. It has been found that the type illustrated with the partitioned floor above the base of the pot, thus providing place for four instead of two entrances, is, as would be expected, greatly more efficient. The fishermen also find that the crab pot frequently catches its own bait in the form of so-called "sardines," various types of herringlike fishes, such as menhaden, which wander into the funnel entrances. Where pots are set in areas of heavy current, fishermen have found it necessary to reduce the height from 24 to 20 inches to prevent them being overturned. Where this construction is used, the opening for removing the crabs is placed at the side of the pot, since only the sides have the double selvage.

The usual method employed by fishermen is to tie the end of the front line directly to the rope bridle attached to two opposite corners of the top of the pot. Where the crab pot is heavily reinforced in its construction, the front line is ordinarily attached simply to one corner.

Complete working plans for the step by step construction of this type of crab pot and examination of the crab pots themselves can be made by anyone desiring to do so at the writer's office.

Details of construction are shown in the accompanying illustrations. This type of crab scrape consists essentially of a welded iron frame. The thickness of the components of the iron used is indicated in the underline to the illustration. The construction is illustrated as viewed from the side in Figure 1, from the front in Figure 2, from the front again but with the net attachment indicated in Figure 3, and the general shape of the net as viewed simply as a flat object in Figure 4. The actual measurements are here given for clearness as indicated from the lettering shown in Figures 1 and 2, and are as follows: internal diameter of ring at *a* — 1 inch; length *a* to *b* — 3¾ inches; *b* to *c* — 20½ inches; *c* to *d* — 33½ inches; *c* to *e* — 22½ inches; separation between *e* and *h* — 1½ inches; *d* to *f* — 13½ inches; *e* to *g* — 17 inches; *f* to *g* — 12 inches; *i* to *j* — 40 inches. The net laid out as placed in Figure 4 measures 40 inches at the front edge, 62 inches in depth and 15 inches across at the base.



Here's one of the best examples of the size of Louisiana's choice crayfish.

LOUISIANA CRAYFISH

It is interesting that the familiar spelling and pronunciation, "crawfish," is excellent English, for this term was used in the United States as long ago as by Say in 1817 when, as part of that remarkable colony in Harmony, Indiana, he was making American zoological history. The name "crayfish" was derived from a French word, "écrevisse," which entered the English language when the Normans conquered England in 1066 A.D.

Crayfish, biologically, are incalculably more important than an item on the menu of some famous New Orleans restaurant. They play an extraordinarily basic role in the relationships, technically termed "ecology," of a wide variety of native mammals, birds, reptiles and fishes that make up the usefulness of Louisiana wildlife, both for the sportsman and for the person who commercially exploits these resources.

They form extremely substantial and, in some instances, virtually critical elements in the wildlife food chain, not alone themselves serving as food, but also in other important relationships by destroying in early stages the vegetation that serve economically important species as subsistence.

Crayfish, in spite of their great commercial importance and their equally high importance as a basic element in the wildlife pattern (usually unrecognized), have been somewhat neglected in the matter of careful, scientific study of their life histories and the factors which control their abundance.

Crayfish production figures can only be estimated since there is no tax or other revenue derived from them.

The United States production for 1888 was reported as 23,400 pounds with a value of $2,140, over a third of this quantity being ascribed to New Orleans.

United States Census Report for 1908 gave Louisiana production of 88,000 pounds with a value of $3,600.

William S. Werlla, supervisor of revenues of the Department of Wild Life and Fisheries, very kindly provided the writer with the following statement of crayfish production for 1950. It must be pointed out that these returns are not obligatory and were simply included in other producer and dealer reports which were required by law. They are as follows:

State Retail Dealers	11,797	pounds
New Orleans (French Mkt).	49,359	"
Thibodaux	5,246	"
New Iberia	7,641	"
Baton Rouge	937	"
Vacherie	50,376	"
Belle Rose	25,150	"
Plaquemine	11,920	"
Total	162,426	"

It should be noted that Werlla believes that this represents only about 10 per cent of the actual crayfish take, which would thus make the 1950 production of the order of 1,624,000 pounds.

Werlla further states: "Crayfish are sold by the pound. At this time they are priced between 25 and 30 cents per pound. They are sold through wholesalers, retailers and producers to the consumer and processing plants. Processors convert crayfish into crayfish bisque, crayfish Creole and these products are canned and sold throughout the United States. I would estimate that Louisiana produces 80 per cent of the crayfish in the United States. This is due to our climate and to the areas in Louisiana suitable for their propagation."

There is no quantity limit imposed on the taking of crayfish for any purpose in the State of Louisiana. Those commercially dealing in crayfish require a license.

It should be here pointed out that the writer has constantly noted a general popular confusion of the name, "sea crayfish," with the completely different group, the fresh water crayfishes, which are discussed in this article. The sea crayfish, also called the spiny lobster (and in the New Orleans markets chiefly known as Florida lobster, langouste and langosta), is technically known as *Panulirus argus*. It is a rare animal in Louisiana since it abhors silted water. It actually belongs to a special group of shellfish, a group closely related, however, to the group which is composed of the much more closely related true sea lobsters and the crayfish here discussed.

The productivity of a favorable crayfish habitat can be extraordinarily high, yet can be completely and with extreme rapidity swept away by drainage. The writer was particularly struck by the crayfish crop present in 1949 in a naturally inundated meadowland adjacent to his fishing camp in Lafitte. A week-end morning, the writer counted sixty-five energetic crayfishermen at work. Conditions that year were evidently optimal since three young men using ten to fifteen crayfish nets each and lifting them every five minutes (as many as forty crayfish were taken in one lift of one net) caught in eight hours of work twenty-two sacks of crayfish, a total of 2,420 pounds. (A sackful of crayfish averages 110 pounds in weight.)

The same year (1949), the meadows were drained during the summer and autumn and crayfishing there, once spectacular in production, completely ended.

The price at that time was $10 a sack. The price last year at the beginning of the crayfish season was $20 a sack, paid to the fishermen by the dealers, and the crayfish were retailed at that period of time at the price of 40 cents a pound.

Louisiana crayfishermen use wire square framed crayfish net 12 or 15 inches in size with a 1½ inch mesh. Frequently, these are knitted by the crayfishermen themselves.

Viosca has recently brought to attention an interesting recent development in one Louisiana area, Bayou Pierre Part, where the native fishermen catch deep-water crayfish by means of traps constructed of 1 inch galvanized wire poultry netting, which take the form of modified minnow traps (also, much like cage-cone rat traps). The individuals in this deep water attain an exceptionally large size.

Viosca states that one fisherman operates three lines totaling 105 traps which, lifted twice or three times a day, normally yield 500 to 1,000 pounds of crayfish, the maximum being 14,000 pounds.

A number of different species of crayfish occur naturally in Louisiana, but of these only two are important as human food. The two market kinds of crayfish are the Red Swamp crayfish, which occurs in Louisiana wherever there are suitable habitats, which range from lake edges, bayous, pounds, ditches, marshes and swamps in which the water is either fresh or slightly brackish. It is typically a shallow water crayfish. Various technical names have been applied to it, but it is best known scientifically as *Cambarus clarkii* Girard. The other market species, the White River crayfish, as it is often called, is presently known technically as *Procambarus blandingii acutus* (Girard). Penn states that it: ". . . is typically an upland species, being found mostly in the upland piny-wooded, sandy-bottomed, swift-flowing streams as well as hillside ponds. It is also found to a lesser extent in the Mississippi River and in the lowlands, sometimes alongside *clarkii* in ponds; but generally the two do not thrive together, and one is usually much more abundant than the other in a given pond."

The large Red Swamp crayfish, which is one of the most common crayfish species in Louisiana, provides the bulk of the Louisiana crop, is most abundant in marshes ranging from purely fresh to brackish water. It spends its early life in the deeper water (2 to 3 feet) in shallow marsh lagoons and as it matures and the breeding season approaches, it migrates to the 6 inch depths of the shallower water of open marshes. At

Chalmette, Louisiana, the Red Swamp crayfish almost completely shift twice annually between the lagoons and the open, slightly brackish marshes. At the same time, shallower ditches and in rice growing areas, the inundated rice fields exhibit a large population of mature crayfish whose presence crayfishermen detect by searching for shallow, muddy water areas showing many uprooted plants.

Crayfish activities are greatest at night, individuals of all ages concealing themselves under vegetation during bright sunlight. Cloudy, rainy weather activates them during daylight hours. Every spring or autumn rains stir the crayfish to roving activities which bring them to the attention of birds and other animals. Observation by Penn at Chalmette showed thousand of crayfish "in berry" together with young in the first and second moult stages during the latter part of August and the first part of September. Most of the adults were in open water but some were in burrows. July, August and September, he found, showed the majority of females bearing eggs. Other observations of this investigator revealed spawning as early as late June and as late as October. Erratic spawning was noted at least in May and in December, but was apparently negligible in importance.

Number of eggs varied with the size of the individual, averaging 313 in an examination of 135 individuals. The eggs, as is well known, are attached to the swimmerets of the female and are carried. Hatching occurs in fourteen or fifteen days. Sometimes the hatched young return and cling to their mother for as long as an additional twenty-seven days, but usually they become independent five days after hatching.

Penn believes each individual female produces only one brood a year in spite of the fact that the spawning period does extend through four months.

Crayfish, like crabs, lobsters and shrimp, to grow, must moult (shed their external skeleton, an operation technically known as ecdysis). This process can be predicted accurately from one to three days in advance because these about-to-shed crayfish, termed "busters," show a white "waist" between the "head" (cephalothorax) and the "tail" (abdomen). "Busters" and the shed "soft shells," like corresponding stages of many other crustacea, seek shelter of vegetation for protection during this vulnerable period.

The long egg laying season produces crayfish populations of highly mixed sizes. Growth conditions appear best in late February and March, so that crayfish attain a marketable size by April. May, June and July shows a population, Penn found, that consists mainly of adults of edible market size, 1.4 inches and more in length. Males were found to be mature when 1.2 inches in length. The smallest females with mature eggs were similar in size. These appeared only in late July and August and many larger females did not contain mature or nearly mature eggs in early July.

A strange phase of the crayfish life history is the fall migration, and death of the adult males. This takes the form of roving bands so preponderantly female that out of one collection of 750 crayfish taken while they were crossing a Chalmette highway only twelve were females. The males were in very poor condition, obviously so sick and feeble that they were soon to die and were naturally unfit for food. Why they undertake this peculiar way of ending their existence, no one knows.

These migrations of old males, which often involve spectacular tens of thousands of individuals, must not be confused with the restless overland movements of obviously amorous, healthy males and egg bearing females that occur following August and September rainstorms. Some few of these "death migrating" groups of males are actually immature individuals, the result of late spawnings and may live over the winter. It is believed that the majority of male crayfish which have become sexually mature during the summer and autumn do not survive the winter.

The females, both those that have spawned and those that have not spawned, undoubtedly overwinter in burrows, then undergo a spring moult which invigorates them and prepares them for spawning in their second year. Great numbers, of course, are destroyed by natural enemies and other causes. Males who are too young to breed during the first summer and which have not joined the overland migrations also are capable of overwintering in swamp-floor burrows.

There is apparently no clearly confirmed information concerning the longevity of crayfish, although a length of life of as much as six or seven years has been ascribed to some of the crayfish species in northern United States.

Crayfish, like many other crustacea, maintain their balance by means of peculiar organisms which take the form of a pair of pits (the statocysts) opening to the exterior on the sides of the head. Each statocyst contains sand grains which, responding to gravity, take the place of the staloliths, and signal to the crayfish whether it is right side up or upside down. Naturally, after each moult of the crayfish, these sand grains must be replaced from the outside. An amusing and quite instructive experiment can readily be performed by replacing these sand grains and then subjecting the aquarium in which the crayfish are to a magnetic field. By varying the direction of influence of the magnet, it is instantly possible to compel the crayfish to swim consistently in all manner of absurd positions, on its side or upside down at will.

Crayfish feed on a wide variety of organic materials and, on occasion, have been known to destroy fish eggs. They do, however, afford such a valuable food supply for game and commercial fish and other animals, including mink, muskrats, opossums, raccoons and useful birds, that this incidental damage to fish spawn is probably a minor matter in the general wildlife pattern. One of their favorite foods is the exceedingly objectionable alligatorweed (alligator grass), technically called *Alternanthera philoxeroides,* and they also extensively eat another objectionable water plant, *Cabomba caroliniana,* which in southern Louisiana, as Ted O'Neil points out, has been given the name of "crayfish moss."

Crayfish enemies include, besides man, herons, ibises, reptiles including snakes, alligators and turtles, mammals, including such fur bearers as the mink, muskrat, raccoon and opossum, various kind of frogs including our two species of bullfrogs, fishes including many species of importance as forage fish, as game fish and as commercial fish. Crayfish are particularly useful in the natural food pattern because they occur not only in water but on land and go through such a graded series of sizes in their growth that they become available as food for a greatly wide range of sizes and kinds of wildlife.

It should be here noted that crayfish are highly cannibalistic and the scattering of the young into shelter is a natural protective behavior.

The degree to which crayfish of various species and various ages contribute to the food of fishes naturally varies with season and other factors. It may be cited, for example, that an examination of 131 specimens of bowfin (best known in Louisiana as the choupique) revealed that 14.1 per cent of the total food was made up of crayfish. Penn has made valuable observations on the dwarf crayfish *(Cambarellus shufeldtii)* which has been highly recommended for use in fish culture:

"Because of their small size there is little danger that they will roil the water, burrow deeply into the levees, or extensively destroy the larger vegetation, and finally, they are just large enough when adult (usually about 1 inch long) for fingerling bass and sunfish to feed on extensively."

Troost's turtle, a common turtle, is of substantial economic value in Louisiana because this state produces most of the "souvenir" turtles that are sold in pet stores, novelty shops and at fairs (the eggs of this species are dug up by the thousands in some of the southern states, notably Tennessee, for use as fish bait). Crayfish form a considerable element of the food of this species.

Frequently, there has been brought to the attention of the writer the occurrence of external transparent worms belonging to the group of invertebrates known as the flatworms, which may occur in very great numbers, particularly on the gills of the crayfish. Although these are parasites apparently deriving sustenance from their host, they are quite harmless to man. The simplest way to get rid of them is to put the crayfish in salt water, which so agitates the parasites that they quickly detach themselves and can then be washed away.

The activities of the burrowing crayfishes often cause considerable damage to lawns, to gardens and to pond dams, particularly those constructed in fish culture operations. It is for this reason that here given are methods of destroying such objectionable crayfishes.

Two simple methods for destroying crayfish in lawns are:

First, dissolve 1 pound of chloride of lime in 3 gallons of water. Put some of this solution in a watering can with the sprinkler removed, leaving only the bare nozzle. Pour about a tablespoonful of this liquid down each crayfish burrow and close the opening of the burrow by pressing the earth together with the foot. The chloride of lime will kill the crayfish within a few hours.

Second, inject only two or three drops of carbon bisulphide into each crayfish burrow and close the opening by pressing together the earth at the burrow entrance. The vaporized carbon bisulphide will quickly kill the crayfish. It must be remembered, however, that carbon bisulphide vapor mixed with air is highly explosive and caution must be exercised to avoid any possibility of igniting it.

In large scale operations previous to the development of 2, 4-D, 1 to 2 ounces of a dilute emulsified coal-tar creosote stock dip were injected into each burrow. The dilution was 1 gallon of stock dip to 100 gallons of water. Best results were accomplished in early spring when the water level was near the ground surface and most of the burrows were open. This emulsion to be effective must reach the water in the burrow.

During the past several years, broadcast applications of various newer chemicals were used and were found to be more efficient than single burrow treatment on farm land. Particularly successful was the use of 1 pound of 50 per cent wettable DDT mixed with 1½ gallons of water and spread on 1½ bushels of cottonseed, this quantity being a satisfactory application for 1 acre. The best results were secured when the baits were broadcast just after a heavy rain. It was found that about 40 pounds of ground up corn cobs or 33 pounds of cottonseed hull or dried silage could be used instead of cottonseed. This was most effective when used in early spring at a time when the burrows were open and the crayfish were foraging at night during rains or just after heavy rains.

Certain species of crayfish have become adapted to a life in lightless caves and under such conditions they, like many other species of crustacea and many other forms of aquatic life including fish, may become completely albinistic, their eyes reduced and without any pigment spot and their bodies pallid, in sharp contrast to the usual colorful crayfish pattern. Often these albino cave-dwellers can be shown scientifically to have originated from closely related normal appearing species.

Another type of unusual coloration that is most rare involves abnormality in the chromatophores, the pigmented cells that constitute the basic color pattern. Chromatophores are of different classes bearing characteristically different colors, the blending of which produces the observed external color of the animal. Particularly startling is the appearance of crayfish that, apparently through the absence of the yellow class of chromatophores, are not green but a most startling and brilliant blue.

Still more spectacular are crayfish in which this abnormal color is restricted to the right half or the left half of the body with a sharp line of demarcation. This phenomenon occurs also in the American lobster. The cause of these extraordinary coloring variances is bound up undoubtedly with an abnormal embryological pattern in the case of the symmetrical "one-sided" difference and, apparently, in the case of the entirely blue crayfish, it is bound up with some upset in the chromosomes which constitute the creature's genetic inheritance.

THE LAMPREY

Lampreys, which constitute one of the strangest group of fishes in the world, and which do occur in Louisiana, have recently aroused continent-wide interest and alarm. The reason for this is that one species of lamprey, the sea lamprey, has caused within the last few years one of the most sweeping disasters in the history of North American game and commercial fishing. It is the purpose of this discussion to set down the description of this dangerous lamprey, the sea lamprey, also, the description of the nondangerous but likewise parasitic chestnut lamprey, specimens of which have been sent in to the writer by sport fishermen from various parts of Louisiana, and, also, to describe the nonparasitic lamprey, specimens of which have not yet been reported from our state.

Lampreys, with the exception of the peculiar 2 to 3 inch long wormlike lancelet fishes, are the most primitive of all our fish species. Lampreys are immediately distinguished from the higher fishes by the fact that they have no gill covers, no jaws and no paired fins. Instead of gill covers, lampreys possess seven pairs of laterally placed apertures which are not consolidated, as in the higher fishes, into a single system. Instead of jaws, lampreys possess suckerlike mouths provided with, in the case of the parasitic species, concentrically placed circles of rasping teeth and, in the case of the nonparasitic species, scattered groups of weaker, similar structures. Lampreys conspicuously lack the paired fins (pectoral fins and pelvic fins) characteristics so obvious in our common game and commercial fish and which fins actually correspond to and are the precursors of the wings and legs of birds and the fore legs and hind legs of other higher animals.

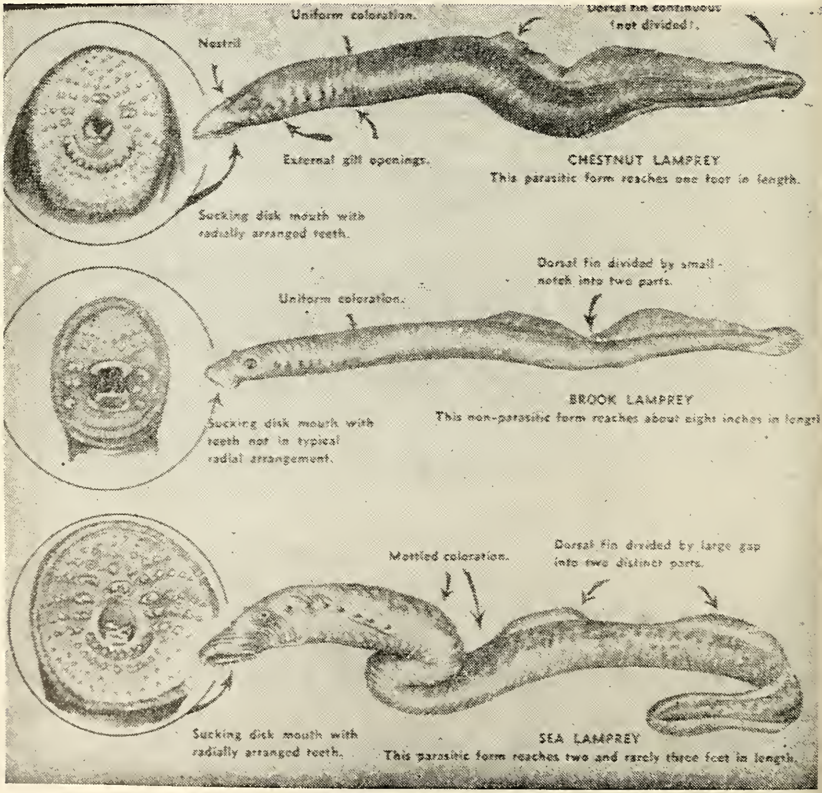
The two groups of lampreys, the nonparasitic and the parasitic, besides differing in their external appearance, also have a most extraordinary difference in their life histories.

All lampreys lay eggs which hatch into strange larvae, technically known as the *Ammocoetes* stage. These larvae, which feed on both plant and small animal materials, may pass three or four years sheltered in the mud bottoms of rivers before they transform into the adult stage. The parasitic lampreys become active predators, living on game and commercial fish. By means of their rasping mouth disks, they bore their way into their prey, feed upon the blood, flesh and organs of the fish attacked, and in the end leave merely a hollow skin containing a well-cleaned skeleton. Even where the attacked fish, through some circumstance, is able to free itself from the lamprey, the wounds inflicted are so severe that death through hemorrhage or subsequent infection frequently ensues.

Sharply contrasting with this life history is that of the nonparasitic lamprey, one example of which, the brook lamprey, is illustrated herewith. Once these nonparasitic species transform into the adult stage, their alimentary tract degenerates and they cease to feed at all. They mate and then quickly die. Likewise, the parasitic species of lamprey, although they may live for several years in the adult stage, also die following their breeding season.

It must be explicitly emphasized that the sea lamprey, concerning which we now speak, does not occur, as far as is known, in the State of Louisiana. The sea lamprey has an extraordinarily wide range, occurring in the Atlantic Ocean from the northwestern coast of Africa, western Europe, westward to Greenland and southward along the Atlantic Coast of North America as far as northern Florida. The most recent authoritative work states, "It is not known in the Gulf of Mexico nor from the drainage area of the latter." This grisly animal has been the cause of one of the most spectacular destructions of game and commercial fish in the history of our continent. Attaining a length of as much as 40 inches, it is blackish in color, mottled, and with its sucker-like mouth (buccal funnel), which is much broader than the body and provided with strong, pointed teeth. The dorsal fin, as shown in the illustration, is divided very distinctly by a large space into two parts.

Originally, the sea lamprey lived in the ocean and migrated up fresh water streams to breed. Certain conditions were necessary for successful spawning, including the presence of gravel, to which the females, by means of their peculiar sucking disks, became attached and after mating produced as many as 230,000 eggs. The *Ammocoetes* larvae hatched from these eggs remained buried in the river bottoms for as long as four or five years, being

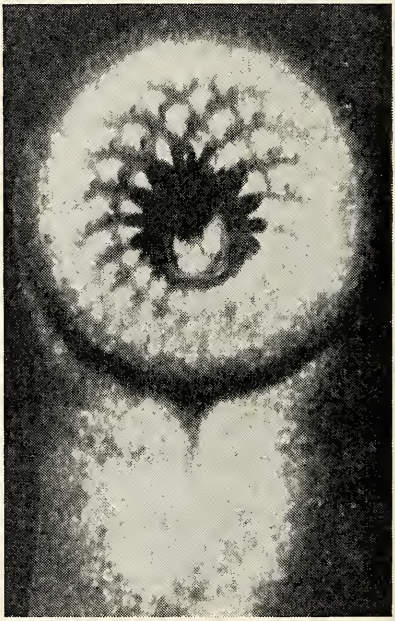

Uniform coloration.
Dorsal fin continuous (not divided).
Nostril
External gill openings.
CHESTNUT LAMPREY
This parasitic form reaches one foot in length.
Sucking disk mouth with radially arranged teeth.
Dorsal fin divided by small notch into two parts.
Uniform coloration.
BROOK LAMPREY
This non-parasitic form reaches about eight inches in lengt
Sucking disk mouth with teeth not in typical radial arrangement.
Mottled coloration.
Dorsal fin divided by large gap into two distinct parts.
Sucking disk mouth with radially arranged teeth.
SEA LAMPREY
This parasitic form reaches two and rarely three feet in length.

known at this time as "mud lampreys," then they transform into the adult stage and descend into the ocean and became dangerous, destructive parasites on valuable fish species. The end result was that the sea lamprey did its damage at sea and did not harm fresh water fish. However, a group of sea lampreys became landlocked in Lake Ontario and carrying out their full life history in fresh water, they became disastrous destroyers of fresh water fish. This presented a dangerous situation which fortunately at that time was prevented from spreading because the lampreys were incapable of ascending Niagara Falls and were thus barred from the highly valuable fisheries of the other Great Lakes. The Welland Canal was constructed and the gateway to disaster opened. The sea lamprey reached Lake Erie in 1921, Lake Michigan in 1936, then spread into Lake Huron and Lake Superior. It has now extended its range as far west as Chicago.

The impact of this parasite on tremendously valuable fisheries which formed the livelihood of many thousands of people can scarcely be exaggerated. A fisherman, for example, who ordinarily, caught 6,000 pounds of lake trout with his four miles of nets set in Lake Michigan off Waukegan, Illinois, five years ago, last year caught not 6,000 pounds of lake trout but simply six lake trout. The Lake Michigan catch fell from 6½ million pounds in 1945, to a half million pounds in 1949. The Lake Huron catch fell from 2 million pounds per year to zero. In terms of dollars, lampreys are costing commercial fishermen, it is estimated, $3,200,000 a year and this loss is undoubtedly matched by an equivalent monetary loss to sport fishermen.

The extent of this expanding disaster was quickly realized by American and Canadian federal, state and provincial authorities. Highly organized programs employing the skills of specialists and the use of every possible known technique were initiated and are now being pursued but none has yet proven successful. Among the devices utilized experimentally were electric screens to prevent the entrance of the adult lampreys into new areas. These operations, extremely expensive, are in spite of the greatest vigilance capable of complete failure since the ingress of only a few breeding lampreys can provide a potential population of millions.

Attempts to poison the beds in which the *Ammocoetes* larvae grow up prove costly and ineffective since it is so difficult to impregnate a silted river bottom with a control concentration of a toxic substance. The most recent device that has been tried with apparently considerable promise of success is an electrocuting fence which, thrown across the lamprey breeding areas, can be used to kill the transformed young lampreys as they pass through the meshes of this charged mesh work. It is perfectly clear, however, that the engineering alone involved in carrying out such a program is complicated, costly and almost incapable of being complete.



A closeup of the circular mouth of a sea lamprey. Lacking both upper and lower jaws, and having teeth radiating in all directions in curved rows, the mouth of the sea lamprey is used solely as a sucking disc.

It should be noted in passing that sea lampreys were regarded during the Middle Ages as great delicacies. The recipe for their preparation for some weird reason required that they be drowned in wine. They were caught in large numbers for market as late as the middle of the last century but for some reason were never used in the southern part of their American range. Later, they became chiefly utilized as bait for codfishing and other commercial fisheries. The North American distribution of the sea lamprey rises in intensity of concentration as one moves southward from Greenland, through New Hampshire (where a river is named for them), to a center of abundance in the coastal areas between Delaware and Chesapeake Bays. It should also be noted in passing that lampreys here discussed are no relation whatever to the peculiar "lamper eels," which are actually tailed amphibians, common in Louisiana, and invariably when discovered during ditching operations, they are objects of profound horror, although they are quite harmless.

The question of profound importance to Louisiana fishermen is, naturally: "Are we in danger of being invaded by this frightening pest?"

The writer has endeavored to examine all the available facts and to discuss the matter with authoritative researchers engaged in direct attack upon this problem.

Previously experts thoroughly familiar with the lamprey problem expressed to the writer in conversation and correspondence that the sea lamprey could not reasonably become a Louisiana problem. That opinion they have now changed. The earlier view was based, first, upon the fact that the sea lamprey requires gravel beds for spawning purposes. Such beds, however, do indeed exist in Louisiana waters and their assumption of the completely silted character of our lower waterways was not correct. Second, this view was based upon the fact that the westward and southward spread of the sea lamprey had encountered a barrier of a half mile of dry stream bed near Chicago which blocked it from entrance into the Mississippi. The unpredictable pattern of floods certainly makes possible the elimination of this as a permanent barrier. No sportsman or no commercial fisherman in Louisiana should fail to comprehend the sweeping disaster that would be caused by the entrance of the sea lamprey into our state waters as a breeding species.

Apparently, the chestnut lamprey nowhere in its entire range effects serious damage, although the writer has received specimens that have been taken while attacking catfish, large-mouth black bass ("green trout"), buffalofish, white crappie and black crappie and other species.

It is desirable that any lampreys taken be sent in, direct to the writer. These specimens should be placed in a jar containing one part of formaldehyde to nine parts of water. The side of the body should be slit to permit the entrance of the chemical.

Information needed is the date and place of capture and the identity of the fish to which the lamprey was attached. Not only will this cooperation serve a good scientific purpose in increasing our knowledge of the distribution of lampreys in Louisiana, but it can provide the Department of Wild Life and Fisheries with an alerted warning service against invasion by the sea lamprey. Should this species through any circumstances become adapted to Louisiana conditions, there is simply no limit to the possible damage it can do to our fisheries. It must be remembered that before its adaptation to a permanent fresh water life cycle, it had a completely different way of life. No one could predict that within a matter of only a few years, it could wipe out the value of millions of dollars invested in the fisheries of the Great Lakes. The writer has repeatedly received from the Great Lakes areas letters from commercial fishermen whose large enterprises have been completely wiped out and who are now seeking to engage in fishing operations in our state. Add to this the realization of the pattern whereby the sea lamprey has completely wiped out vast equities concerned with game fishing in the Great Lakes and it will then be realized how much of a castastrophe this extraordinary parasite could cause where, by some unpredictable chain of events and adaptations, it could learn to live under Louisiana conditions.

WHITE PERCH AND CALICO BASS

The crappies belong to the sunfish family, the Centrarchidae, a group of fishes that occur naturally only in the North American continent. The 25 species of Centrarchids include some of our most important and most popular fresh-water game fishes.

All of the sunfishes are fresh-water species, although some may enter brackish water as, for example, in Lake Pontchartrain, Louisiana.

For ordinary purposes, the sunfishes can best be understood if they are divided into three groups:

First, and most important, the basses, of which we have in Louisiana the large-mouth black bass and the Kentucky or spotted bass;

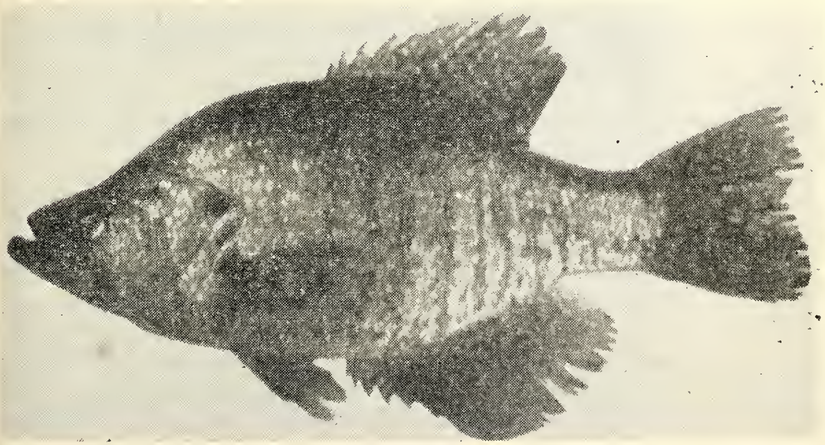
Second, the two species of crappies, and;

Third, the rest of the species which are more usually referred to as sunfishes, bream or any other of some hundreds of different individual names.

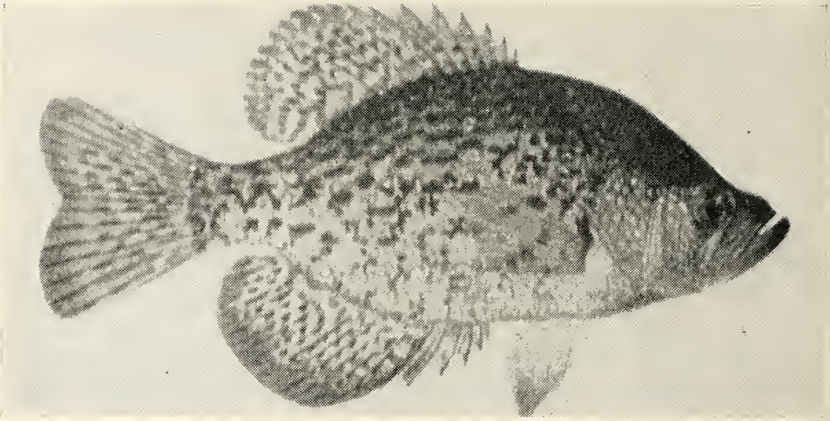
These three groups of the sunfish family represent their descending size in the same order. Indeed, one of our sunfishes, the pygmy sunfish *(Elassoma zonatum)*, 1-inch long, is the smallest of all our American fishes, while the largest of the group, the large-mouth black bass *(Micropterus salmoides)* has provided a rod and reel record of 32½ inches in length with a weight of 22¼ pounds.

The sunfish family are all nest builders. Their culture involves the use of ponds for rearing them since, unlike such other sport fish as the northern true trout, the salmon and the pikes, they cannot be stripped and their eggs fertilized and reared in hatchery jars.

The two crappies are beautiful fish, so similar in appearance, however, that they are frequently confused by fishermen. This is particularly due to the fact that both the white crappie and the black crappie can, in response to light, change the intensity of their coloration in a matter of minutes. Very frequently, the fisherman who has captured a fine string of white crappie in brightly sunlit waters and then has moved and hung out his fish in some shadowed place will be astonished when on lifting them,



The White Crappie (Pomoxis annularis), also called in Northern Louisiana the White Perch and in Southern Louisiana, the "Sac-a-lait."



The Black Crappie (Pomoxis nigro-maculatus), also called Calico Bass and the Speckled Crappie.

he finds that they have so completely altered in coloration. This is due to the response of the pigment cells of the fish to the intensity of the light received by the eye.

The two crappies can be distinguished readily if attention be paid to three diagnostic characteristics: first, the number of spines in the dorsal fin; second, the slope of the dorsal silhouette; and, third, the comparison of the measurement from the tip of the upper jaw to the front edge of the eye with the measurement of the breadth of the eye itself.

First, the white crappie usually possesses six spines in the dorsal fin, though often five or seven may be present. The black crappie possesses seven or eight spines in the dorsal fin, though six to ten may be present. The more complete range of spine counts is indicated below.

Second, the white crappie presents a definitely more S-shaped curve in the outline of the back than does the black crappie, a characteristic that is well shown in the accompanying illustrations.

Third, the white crappie exhibits a definitely greater distance between the tip of the upper jaw and the anterior edge of the eye than is the breadth of the eye itself, while in the black crappie this measurement from the tip of the upper jaw to the front edge of the eye is equal to the eye breadth.

The popular names of these two fishes are extremely confusing since the white crappie bears numbers of popular names, too numerous to list here since many of them are extremely local in usage and the black crappie bears a number of popular names which are equally useless.

In Louisiana the terms white and black crappie are very seldom employed. The white crappie is known throughout the northern part of the state as the white perch, which causes a great deal of additional difficulty since this is actually the accepted name of the true white perch *(Morone americana)*.

Throughout many of the southern parishes, it bears the odd popular name of "sac-à-lait."

The two crappie species together bear over sixty colloquial names.

The usual concept of a "pan fish" is that it is a fish of good game qualities, high in merit as a food fish and is in average size about a pound or more. Using this definition, the white crappie and black crappie are ideal examples.

Pan fish among the 600 or more fishes that occur in the United States and the 13,000 or more species known throughout the world occupy a place of importance far out of proportion to their number, since they preeminently contribute to providing food and sport for anglers of all ages and predilections and all interests as sportsmen.

They tagged 1,000 crappie, all of legal angling size, which were trapped in hoop nets set and lifted daily at the entrances of the backwater. These taggings were conducted from March 14th to June 9th. Only ten of the 1,000 tagged fish were recaptured by late June. The distance traveled by the recaptured fish ranged from a few hundred yards to one-fifth mile. The average elapsed time between tagging and recapturing was 25 days. The average minimal distances moved was seven-tenths of one mile.

The precise location of the tagging operations was the most favorable available, thus the recapture of only 1.1 per cent would indicate that the harvesting of the crop was quite inadequate.

The necessity of closed season for fresh water game fish is a matter of perennial controversy amongst sportsmen.

The writer, after careful consideration of all the evidence, believes that no such closed season is necessary in Louisiana, and further believes that the imposition of a closed season on fresh water game fish, far from accomplishing beneficial results, actually is a detrimental measure since the results of modern fresh water fish management research have established beyond all doubt that with properly enforced legal number and legal size limits, the more fish you catch, the more fish you will catch. Only under certain circumstances is fishing pressure the basic factor in depleting fish supply. Ordinarily, the "limiting factor" is the food supply present in the lake.

Unless a balance is maintained so that the fish crop is transformed into an unremunerative enterprise where a preponderance of undersized fish will compete for food, resulting harvested regularly and the big fish caught, the lake may become in stunted growth. This is particularly true of the crappie since, although they, like the large-mouth black bass ("green trout") and the Kentucky or spotted bass, are predacious, they do not feed to the same extent upon small fish as do the basses. The result is that the larger crappies actually compete with the younger crappies for food. Fishing out the large size crappie population simply clears the way for the growth of a good, legal-sized sportsman crop.

A further matter might be mentioned here which is again a matter of much controversy between sportsmen and commercial fishermen. This is that the taking of coarse fish, such as buffalo, suckers and carp, from a fishing lake is an extremely effective procedure in maintaining a fishlike balance favorable for the sportsman. Naturally, such a taking of the coarse fish crop must be done with care or under strict supervision so that the ever present possibility of the illegal sale of game fish incidentally caught in such seining operations be fully prevented.

Studies have revealed that the white crappie does produce a large number of eggs. A single Ohio specimen 7½ inches long total length contained 14,750 eggs, while 42 females, also studied in Ohio, averaged 7,120 eggs with a range of from 2,900 eggs to 14,750 eggs. The black crappie exhibited an even wider range.

Five three-year-old Indiana females averaged 33,712 eggs, with a range of 26,700 to 41,562 eggs, while 5 four-year-old females, also from Indiana, averaged 41,879 eggs, with a range of 30,139 to 65,520 eggs. The highest egg numbers found by researchers were exhibited by five 20 to 24 ounce Minnesota black crappie which averaged 137,000 eggs, with a range of 77,000 to 188,000.

Contrast with these crappie egg numbers those of our common Louisiana mosquito fish or top minnow *(Gambusia affinis)*. This species is ovoviviparus, the eggs being retained in the body until hatched and the young are thus born alive. Hildebrand found in his studies that the most eggs carried by one female was 63, while the average was 40.

Contrast again with this the egg numbers of the eel, a species which spawns at sea under circumstances of greatest possible hazard since the hatched young must find their way from the single eel spawning ground in Bermuda to the waters of the United States and to the waters as far north as northern Canada, where the females mature. A single American eel contained the astounding number of 10,700,000 eggs.

Egg numbers for some of the members of the sunfish family are of interest comparatively to us. Bluegill *(Lepomis macrochirus)* are found to range from 8,000 to 12,000 eggs, large-mouth black bass produce 2,000 to 7,000 eggs per pound of female, while the fry in large-mouth black bass nests averaged 4,375, with a range of 751 to 11,457.

Minus the basses which, after all, are the most prized members of the Centrarchidae, these two crappies (alias white perch or sac-à-lait and calico bass) probably contribute to more pleasure to fishermen than any other two fresh water fish in the entire United States.

LOUISIANA RACCOONS

Raccoons are unmistakable because of their conspicuous black domino which gives them such a quizzical expression. Thirty inches in length, 10 inches of which are a bushy black-ringed tail. The coon has a shoulder height of 12 inches and a weight of 15 to 25 pounds.

The 'coon's fur, which will presently be described in greater detail, is hard-wearing, gray-brown, black in the guard hairs (the external long hairs).

The technical name of the raccoon is *Procyon* (from a Greek word, meaning "before the dog") *lotor* (which is from the Latin, meaning "one who washes"). The odd name of "the washer" is derived from a 'coon hallucination that everything should be washed before being eaten. The 'coon, in carrying out such behavior, is often more than slightly jingled in his cerebration. A captive 'coon will take a frog that is bathed not only every, but most of every day of his life, and promptly dunk him in a cage-pen of filthy water with greatest cheerfulness. It is obvious that such a washing operation, where broken clam shells are involved or where fish secured from liquid mud form the diet would remove objectionable shell fragments and mud spatters. Some students of 'coon behavior, however, entertain an entirely different explanation. The able Cahalane thus expresses that view:

"Why does *Lotor* wash so much of its food? Many naturalists believe that it does not *wash* but that it *dunks,* and derives pleasure from feeling the food under water through its sensitive hands. Perhaps this sensitivity has become an obsession, just as some beavers seemingly hope to flood the world."

'Coons are evidently sharply responsive to local ecological conditions and become differentiated into geographical races, technically termed subspecies and technically designated by a third word to their already dual name.

The 'coons' range is a vast one, extending from Latitude 50 (this is above the Canadian border), southward deep into Mexico.

Both sexes of the 'coon are similar in color with, however, some change seasonally. A compact description follows: "Grizzled gray, brown, and black, the pelage dull brown at base; a black band across forehead and eyes, grayish on muzzle and back of ears; ears grayish, with black area at posterior base; sides with less black than dorsal region; tail banded with alternate grayish and blackish, six or seven dark rings; gray of upperparts, expect that on head, is strongly mixed with yellowish; hand and feet yellowish gray."—*Anthony.*

As long as thirty years ago, seven different races of 'coons were recorded in the United States. Since that time, a number of geographical subspecies have been described, including the conspicuously yellow coastal marsh raccoon (*Procyon lotor megalodous*) mentioned elsewhere in this article, which was first described for science by Dr. George H. Lowery, Jr., November 22, 1943.

Doctor Lowery gives this newly outlawed race the following description: "Distribution—The coast region of southern Louisiana from St. Bernard Parish, west to Cameron Parish." He diagnoses the race as: "A medium-sized raccoon in which the pelage is strongly suffused above with black and pale yellow. Skull massive and with extremely large molariform teeth."

Many of the races of raccoons differ greatly in size as well as coloration, thus the dark, upland Louisiana race and the Louisiana marsh raccoon are both medium sized subspecies, while the Texas raccoon is the largest of all, a total length of 36 inches, while the Chokoloskee raccoon (*Procyon lotor marinus*), restricted to mangrove bordered keys off the southwest coast of Florida, is a very small race, seldom exceeding 8 pounds in weight as against 15 to 24 pounds of other races.

'Coon are apparently somewhat closely related in origin to the ancestral members of the bear family and still more closely to the more western and southern (it occurs as far north as Arizona) coati and closely, also, to that other relative with a black-banded tail, the two and a half pound ring-tailed cat.

The raccoon is also more remotely related to the well-known panda (of China) and the less well-known spectacled bear of Asia.

'Coon in the latitude of Louisiana bear their young in April or May, the period of gestation being approximately sixty-three days (contrast the gestation periods of thirteen days for the opossum and 660 days for the elephant). The young, three to six in number, are born well-furred and soon acquire the characteristic markings of their parents. Their eyes do not open for about three weeks. They attain 7 to 12 pounds of weight by early winter and mate before they are a year old. Fed with milk for the first two months of their lives, the young 'coons are then carefully instructed by their parents in the techniques of capturing their food and evading enemies, particularly men and dogs. The male under natural conditions may remain with the family group occupying the same den until a new litter brings about the dispersal of the family unit.

Studies conducted elsewhere in the United States show that about 200 acres of woodland are needed on the average to maintain a single adult 'coon.

'Coons appear to be sometimes monogamous, sometimes polygamous.

'Coon can at times become serious predators of birds, particularly wildfowl. Expert swimmers, they have beeen observed to destroy both eggs and young of wild ducks, being particularly efficient in raiding wood ducks where they can effect an entrance into the hollow tree. Many game management enterprises designed for propagating wood ducks have ended up as family apartments for 'coon who simply have taken over all the wood ducks' housing facilities. A 'coon in one instance was observed to climb 60 feet to a red tailed hawk's nest, eat the eggs and then go comfortably to sleep.

Probably the 'coon's demonstrated fondness for corn or melons and often for poultry gets him into more trouble than any other of his characteristics.

'Coons are like opossums, virtually omnivorous. 'Coons and opossums clearly compete, with the slight difference that the opossum is more frequently a scavenger.

'Coons, of all our carnivorous native mammals, with the exception of the black bear, make greatest use of vegetable food in their diet. Studies show crayfish, frogs, fish, clams, rodents, birds, eggs, reptiles, insects, fruit, nuts, acorns, corn and practically any edible plant or animal matter are eaten.

'Coon, like other mammals and, indeed, like virtually all animals, exhibit the abnormality of albinism. True albinos lack all pigment and have, thus, pink eyes.

Dr. Clifford H. Pope, the eminent herpetologist, once became godfather to two albino 'coons. Both were pink-eyed and pink-nosed but the female exhibited a faint pattern while the male was totally albinistic.

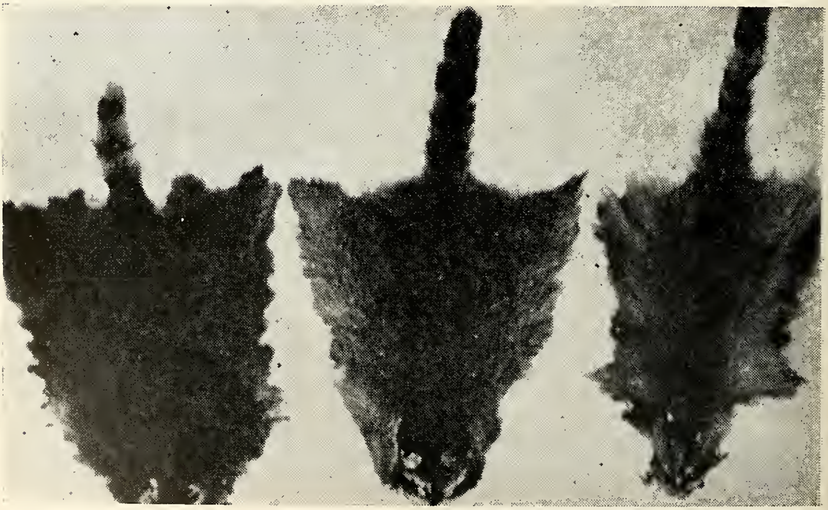
The role of the 'coon as a source of fur constitutes a strangely checkered history both in numerical production and in price index. 'Coon skins during the past twenty years have brought hunters a record high of $9 for a single large, dark, northern pelt. Price fluctuations have been terrific, as reference to the accompanying tabulation will reveal. Thus, the 1945-46 production of 244,502 'coon skins brought an average of $1.50 a pelt, whereas the last season's production, 1949-50, of 73,035 'coon skins averaged for the trapper only 27 cents per pelt. Some of this price fluctuation has been due to changes in fur fashions. There was once, during the eratic twenties, a time when no self-respecting college boy appeared in winter public without a "cocoon of raccoon." Born of those times was that marvelous figure of speech which in describing a Yale-Harvard football game thus read, "The Yale cheering section rose as one raccoon."

A fine specimen of raccoon, fat and prime as to pelt.

Yes, it IS a 'coonskin coat! But it is sheered raccoon, made under the new method of handling raccoon fur and priced at about $500 retail.

Beautiful in color, the leather firm, the fur durable, natural raccoon had the considerable disadvantage of creating an appearance of great bulk, making the wearer seem much fatter than she or he in truth was. That disadvantage may now be eliminated by new techniques. Subjecting the tanned 'coon pelt to a field of electrical discharge causes the long, conspicuous guard hairs to stand on end. Skins in this condition can be run through a shearing machine that efficiently removes the guard hairs, leaving only the rich, soft and beautiful underfur. The end results are startling. "Sheared raccoon" presents a fine appearance, somewhat closely resembling that of nutria (coypu or "South American beaver"), although the latter fur, which must likewise be sheared, exhibits a curly texture of the underfur, whereas the 'coon's underfur is straight.

Such sheared skins contrast amazingly with natural 'coon and must be actually seen and handled before the transformation thus accomplished can be appreciated. Herewith are shown three 'coon skins, the one on the left being the valueless yellow salt marsh 'coon, elsewhere more specifically described in this



'Coon skins from the Department's collection. Left: This is a skin of the new outlawed Yellow Furred Salt Marsh Raccoon. Center: A normal "run of the mill" Louisiana upland Raccoon. Right: A "sheared' run of the mill Louisiana upland Raccoon. Even in this photograph, the smooth and beautiful appearance of the sheared fur is evident in contrast with the naturally shaggy skin. (Photograph by Cresson).

article. This race was declared an outlawed animal by Ernest S. Clements, commissioner of the Louisiana Department of Wild Life and Fisheries in an executive directive, Department Order No. 17, promulgated December 5, 1949, covering in its application twelve coastal parishes.

Surprising, indeeed, is the relatively low cost of the shearing process. Figures secured by the writer from one of the finest fur processing firms in the country, quoted the price for the combined operation of tanning the raw pelt and shearing the tanned hide at $1.25 per pelt in lots of 500 skins or more.

Another presumable advantage of sheared 'coon is the uniformity in color, which might well contribute to much easier matching of fur.

Still yet another great advantage of 'coon skin is its resistance to wear.

The durability of furs is ascertained with high precision by the use of special testing machinery, by means of which the wear of years is compressed into a short time. Otter fur, our toughest known fur, is arbitrarily chosen as the standard and rated 100 per cent. Skunk by this standard rates 70 per cent, mink 70 per cent, dyed mink 35 per cent, 'coon 65 per cent, domestic rabbit 5 per cent. Although undoubtedly a matter of much deeper concern to the head of the household rather than to his wife, durability of furs is an important factor. It was for this reason that here in descending order are tabulated the comparative durabilities of the fur of 18 different species:

Otter	100%
Black bear	85%
Sea otter	80%
Alaska fur seal	80%
Leopard	75%
Mink	70%
Dyed mink	35%
Skunk	70%
Raccoon	65%
Marten or sable	60%
Muskrat	45%
Gray wolf	40%
Red fox	40%

Lynx	25%
Pika or cony	20%
Woodchuck	20%
Hoary marmot ("Brazilian mink")	20%
Domestic rabbit	5%

The project of manufacturing fur coats from sheared 'coon has been carried on in St. Louis, New York and other fur garment manufacturing centers and the price, including tax, about $500. It is already marketed in principal American cities.

Many years ago, 1758 to be exact, an alert European Frenchman, Antoine S. Le Page du Pratz, published in Paris three volumes, entitled *Histoire de la Louisiane,* in which he recounted most entertainingly intelligent observations made during extensive travels through the vast territory that was then Louisiana. This volume tells with surprising accuracy of the plants, of the birds, of the fishes and of the mammals that he found in this strange land. Some of his illustrations, however, are astounding, fantastic, impossible; a state of affairs readily explicable when it is remembered that his artist living in Paris, never once gazed upon any part of Louisiana or upon its animals so thus had a free rein for his imagination.

A fine set of Le Page du Pratz is in the library of the Louisiana State Museum at Jackson Square, New Orleans, where students of the history of early exploration in relation to Louisiana's wildlife can consult these extraordinarily interesting volumes.

Here it may be remarked that the name of the well-known Cat Island (part of the State of Mississippi) in Chandeleur Sound was derived from *Chat sauvage,* literally "wildcat" because these early explorers found raccoons excessively abundant in this island area.

Lac Prier des Chats, "Den of Cats," Lake in Avoyelles Parish is another locative name derived from the 'coon.

The present writer has never at any time anywhere observed 'coons in such tremendous abundance as they now exist in the delta area of Louisiana. He has seen at midday as many as seven adult raccoons sitting together under the live oak on a single *cheniere,* (this is the Louisiana-French name for the shell ridges which, adorned by live oaks, form such a conspicuous element along the delta margins). The name is derived from *chene,* standard French for oak.

Louisiana Raccoon Production

Production	Period	Average Value	Total Value
105,381	1929-30		
52,065	1930-31		
133,470	1931-32		
87,674	1932-33		
169,531	1940-41	$1.00	$169,531.00
208,010	1943-44	1.15	239,211.50
244,502	1945-46	1.50	366,753.00
73,035	1949-50	0.27	19,719.45

WHITE-TAILED DEER

The largest and most valuable of our game mammals in the eastern United States, the white-tailed deer, also called the Virginia deer, adapts itself with surprising readiness to the proximity of man when properly protected.

Deer belong to a group of animals known as the even-toed, hoofed mammals *(Artiodactyla),* all of which walk on the third and fourth toes, other toes being reduced or lost. These include deer, bison, domestic cattle, goats and pigs.

Normally, deer seem to range over little area, sometimes no more than a total of one-half square mile.

Driven to high land by storm high water, these fawns wistfully seek the comfort and protection of the doe, whose ears indicate that she is somewhat overwhelmed at such a family. (Photographed by James Edouard Morgan.)

The period of gestation is stated to be 205 to 212 days (six months, three weeks and four days to seven months and two days).

It is generally assumed that does bearing young for the first time produce a single fawn, and thereafter twins are the general rule and occasionally a doe will give birth to triplets.

Fawns, when born, weigh only 4 or 5 pounds, and are so frail that they travel during the first 25 days of their lives no more than 30 feet from where they were born. Hidden by the mother during this period, they are fed by her a dozen times daily and are additionally protected in their hiding place by the fact that they have a dappled camouflage color, the white spots breaking up the pattern against the dappled background of vegetation. Protectively, also, the fawns, unlike their parents, possess no strong odor and thus do not attract enemies.

Bucks, evidently because of their greater strength, did not, like does and fawns, leave the storm water for dry land shelter. This photograph shows the only two bucks that were photographed, and unlike their families, they departed into the inundated swamp.

Deer antlers, borne only by the male, are true bone and not horn. During the growing season, the antlers are covered with a soft, plushlike "velvet," the blood supply of which supplies the growing antlers. When the growth is complete, the blood supply ceases, the "velvet" dies, peels off, and the bony core remains. Through an extraordinary and incisive operation, certain cells in the blood stream of the deer digest off at the appropriate time, the base of the antlers which change, then fall, the scar being covered over with a new skin from which, the following spring, a new antler develops.

White-tailed deer apparently live ten to fifteen years, observations on captive animals corroborating this. Studies of deer that have been tagged as fawns may give us much more valuable information.

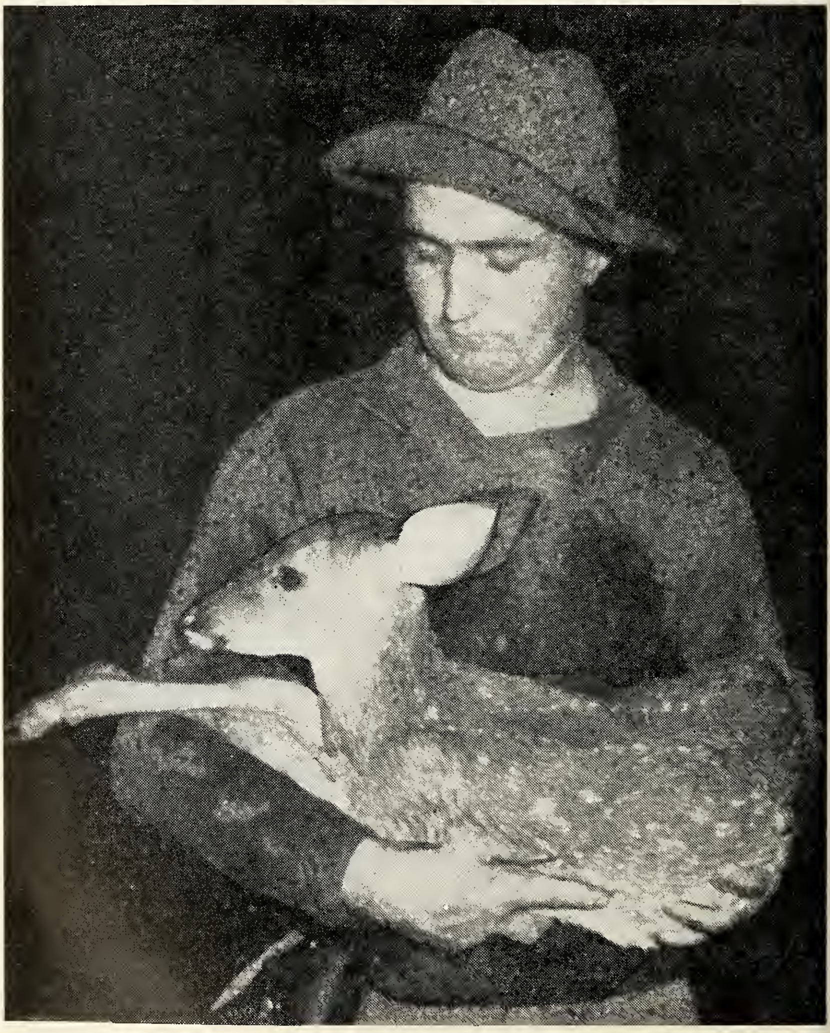
A deer taken near Baton Rouge has been recorded with a dressed weight of 310 pounds.

Average dressed weights for the northern tier of states, related to points, although not necessarily applicable (since our southern deer run much smaller in size) are, however, of interest, and as follows: 2 points—121 pounds, 4 points—138.5 pounds, 6 points—141 pounds, 8 points—161 pounds, 10 points—186.5 pounds, 12 points—200 pounds, and 13 points—245 pounds.

The size of deer, like the size of fish, is always a matter of great interest and great controversy. The writer has endeavored to secure records on the top size of the white-tailed deer. Southern white-tails are definitely smaller than the northern races. Arthur Van Pelt, competent observer of Louisiana wildlife for more years than he declares he is willing to admit, was present at the weighing of the buck taken between Michaud and Bayou Thomas three-quarters of a mile from the Louisville and Nashville tracks about 1917. This animal, largest he had seen in forty years, weighed 304 pounds. Mr. Van Pelt informs me that another deer taken in the Chacahoula Swamp, twelve points, head now owned by Kader Cocke, weighed approximately 300 pounds and was the largest, local hunters stated, they had ever seen.

The heaviest white-tailed buck on authenticated records shot in New York weighed 388 pounds live weight. Scott reported a buck shot near Hayward, Wisconsin (and this was a white-tailed) that "hog-dressed" weighed 386 pounds and had a calculated weight of the almost unbelievable figure of 491 pounds.

Henry Sevier of Tallulah, who, with Sheriff Elliott Coleman, certainly knows as much as anyone about hunting in northern Louisiana, has provided valuable data concerning the white-tails. He states that the largest deer in Madison Parish run about 253



A Department of Wild Life and Fisheries game warden with a young fawn he has rescued from a flooded marsh.

pounds live weight, and that the fawns lose their spots during the latter part of September, the does bearing a single fawn as their first offspring and thereafter produce twins. Striped oak acorns, pink oak acorns, palmetto seeds and wild pecans are the chief foods. The palmetto becomes chiefly important about midwinter. Bucks begin to drop their antlers the latter part of February and early March and in the early spring form large concentrations numbering thirty-five to fifty in a single group.

He says that the white-tails are sluggish in hot weather and on cold, crisp, still mornings feed more in daylight than when the weather is hot. Wind also reduces such feeding activities during daylight hours. He also presents what well may be a controversial subject by stating that a three-year-old and older buck is too strong (their necks are swollen) and not fit to eat and should never be hunted after New Year's Day, whereas a two-year-old or smaller buck is quite palatable until the middle of February. He has one twenty-point buck which he killed.

He believes that one important conservation measure for deer is providing them with a crop of corn. He says that he maintains between 60 to 80 acres in soft, white corn which they happen to like best (Mosby being the variety he uses). Soybeans and peas are also very much appreciated.

The fighting of white-tail bucks may become a matter of great violence, the repeated charges tearing up as much as half an acre of territory. Rare permanent interlocking of the antlers results through starvation in the death of the two foes.

Field observers have noted that deer are capable of running 30 miles an hour, can clear an 8 foot fence and make a running jump over 40 feet.

It may be of interest to point out that violators of deer laws can be invariably detected by scientific precision methods not available even a half a dozen years ago.

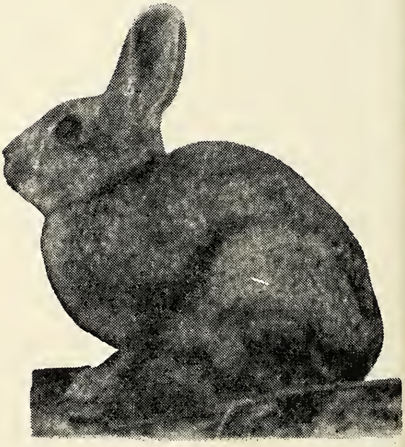
The writer became involved in one such case where flesh of deer shot out of season had been pickled in salt. It was perfectly possible by the use of serum methods to establish that this was deer even though the meat had remained in this state for a considerable period of time. This is specific. Contact with extracts of other animals, such as cattle, goats, sheep, etc., produces no such response.

Still another technique utilized by the writer in aiding court actions is the use of the microscope to identify deer hairs. Animal hairs possess such characteristic forms that not only can species such as the white-tail be unmistakably identified, but even related species of the same mammal group can be named. An interesting instance of this occurred when illegal hunters decided to can their venison. Microscopic examination of the canned meat showed the presence of unmistakable deer hairs, and resulted in conviction.

It is odd to note that where white-tails habitually cause serious damage in truck gardens and orchards, electric fences were effective, but other observers found that bags of moth balls simply tied at intervals along the fence line kept the deer out.

THE COTTONTAIL

Rabbits and the multiplication table have long been popularly associated in our thoughts, yet as we shall presently see, prolific as rabbits are, they require the protection of closed seasons, regulations against "market hunting," and "night shining" with headlights, and where practical, the provision of necessary "cover" and other environmental improvements if an adequate supply is to be maintained for our numerous enthusiastic rabbit hunters. This, it is found, is true in spite of the fact that when rabbits were introduced to the one continent where they were not present, naturally, the great island of Australia, they became a prodigious



A fine portrait of the mathematical Cottontail, master of the multiplication table. **(Photograph by W. M. Rush, U. S. Fish and Wildlife Service.)**

pest and a truly continental calamity. That will be clarified later in this discussion.

Rabbits provide the longest hunting season of any Louisiana game, 112 days (October 15th to February 15th, inclusive). This exceeds by exactly five weeks the seventy-seven-day open season for squirrels and chipmunks (October 15th to January 1st, inclusive).

Louisiana laws allow a limit of five rabbits a day, prohibit the sale of wild rabbits and forbid the hunting by "shining" with headlights.

Rabbits, in spite of the general similarity of their incisor teeth, which are used so expertly in gnawing, are not rodents as squirrels, muskrats, beavers and mice and many other "gnawers." Scientists have separated them from the rodents and have formed for them a distinct group designated as the Lagomorphs (literally "animals having a rabbit-like form"), which group includes all the rabbits and hares of the world, together with those odd Rocky Mountain Lagomorphs, the "pikas" or "little chiefs." Lagomorphs differ, among other characteristics, from rodents in the fact that their "chisel teeth" (the central front teeth or incisors) number four above and two below, whereas the rodents have a total of only four incisors, two upper and two lower.

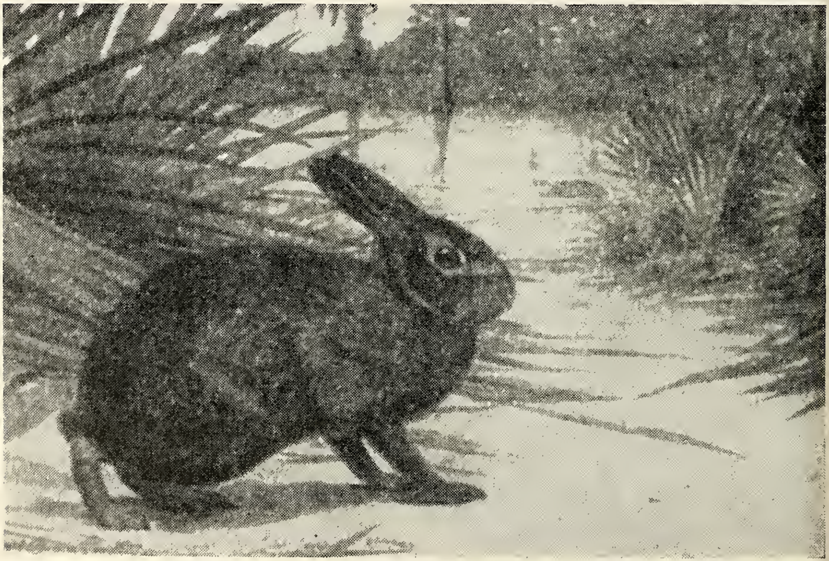
Lagomorphs occurred, naturally, throughout the continents of the world except Australia. Man's introduction of rabbits into Australia was an extremely bad idea.

Rabbits and hares differ in many anatomical characteristics. Usually, hares are larger. Hares are born well furred and with their eyes open; rabbits, pink and hairless, and with eyes that do not open until the young are six or seven days old. Texas "jack rabbits" are really hares, although cottontails of several species and races also occur in Texas.

Louisiana has two kinds of rabbits. Both belong to the cottontail group but for the purposes of this article one species, the smaller, will be referred to as the eastern cottontail, while the other species, which is half as long again, will be designated as the swamp rabbit. The technical names and distributions based upon the observations of Lowery are given here for the sake of those interested in naming our rabbits precisely. The cottontails, a complex group, range with their subspecies all the way from Canada to northern South America. In the United States alone, the cottontail group is split into many species and very many geographical races.

Our Louisiana cottontail, designated scientifically as the eastern cottontail *(Sylvilagus floridanus alacer)* "is abundant and widespread throughout Louisiana" (Lowery).

The eastern cottontail is 14 to 15 inches long. Its color varies from buffy browns, tinged with reddish to brown washed with gray. Side, rump and back are sprinkled with black. The nape of the neck is rufous; fore legs, cinnamon-rufous; fore feet, more buffy than the legs; lower hind legs, intensely dark rufous; tail, rusty brown above; below, clear white (its "cotton tail"). The dark grayish buffy ears have a black border. Young cottontails are yellowish, buffy brown.



Swamp rabbit shown in a typical Louisiana setting of palmetto-fringed bayou. **(After National Geographic.)**

Our larger Louisiana rabbit, which is here termed the swamp rabbit (although it, also, is one of the cottontails) is present in Louisiana in two geographical forms. Both are called simply swamp rabbits. The first, the technical name of which is *Sylvila-*

gus aquaticus aquaticus, "occurs commonly throughout all of Louisiana" (Lowery). The other Louisiana race *(Sylvilagus aquaticus littoralis)* of swamp rabbits, distinguishable only by an expert, occurs in a different distributional pattern overlapping the other subspecies. "This race of the swamp rabbit is apparently restricted to a narrow coastal belt, nearly, if not entirely, within the upper limits of tidewater" (Lowery).

The swamp rabbit is 21 to 22 inches in length. Upper parts are grayish brown washed with buffy; the rump, reddish brown; the sides, grayer than the back; the legs and feet are cinnamon-rufous, while the ears match the color of the top of the head; underparts, clear white, but the throat, dull buffy; tail, above reddish brown; below, white

The fur texture of the tail of the cottontail is loose and the undersurface pure white. The fur texture of the tail of the swamp rabbit is dense and the undersurface of the tail is often dingy in comparison with that of the cottontail.

It is notable that our southern swamp rabbits, as Hamilton has pointed out, "often take to the water and swim easily and swiftly. They have no peculiarities of structure which would stamp them as aquatic . . ." The swamp rabbit's spread toes and relatively large, furred feet permit it to walk easily over soft mud, much as its northern relatives, the snowshoe rabbit, can readily traverse drifted snow.

Our eastern cottontails and swamp rabbits "excavate a shallow depression, which the female carefully lines with fur plucked from her breast and belly. During the day the nest is carefully concealed, covered with grass, leaves, or such matter as is at hand, and the young are unattended in this retreat. During the early evening the cottontail returns to suckle the young, but before leaving them she again carefully conceals the nest so that little or no trace of its presence can be noted. So skillfully is this feat accomplished that the writer daily worked about such a nest located in his garden, often pulling sprouting weeds within a foot of it, but never was apprised of its existence until a dog discovered the retreat and scattered the fur lining."

The female cottontail, by the removal of the fur from her belly, not only provides a warm nest lining for the young, but further makes their nursing easier for them. The mother rabbit rarely visits the young during the daytime but while she is absent, the young sometimes squeal so lustily that they reveal their presence and location of the nest. Prowling dogs are very frequent predators.

Cottontails when born are naked, pink-skinned and blind; 4 to 4¾ inches in length, they weigh 5/7 to 1¼ ounces. A dark first fuzz appears on their flanks the next day, and in a week they are covered with a growing coat of fur that already shows a pattern.

The young cottontails begin to use their eyes and their ears at about the same time, when six or seven days old.

Two weeks old, they are now 3½ ounces, four times their weight at birth. Twelve days old, they venture from their nest but return to huddle together during the night. Fourteen to sixteen days old, they scatter and no longer return home. Five months old, they now weigh 2 to 2¼ pounds.

They can breed when six months old. Cottontails are born about thirty days after breeding.

Cottontails are believed to be capable of attaining an age of eight years, but their longevity under the pressures of destructive forces such as bad weather, predator toll and hunting pressures is very greatly less.

Rabbits, as already indicated, have an enormous reproductive potentiality. Four litters a year can be produced. In the south, pregnant cottontails have been found during every month of the year. Anyone can figure out theoretical rabbits by simple arithmetic. Estimating a conservative four litters a year, each litter with a conservative five young, two rabbits in five years excel fantastically all compound interests rates, for they would not under this theoretical calculation remain the principal of two rabbits but become the spectacular principal plus interest of 322,000 rabbits.

The cottontail, as every hunter knows, performs in nature no such magic, for systematic examination of rabbit abundance has shown that in a given area under usual conditions (epidemics or other such "cycles" being absent), the rabbit population remains approximately the same. Annual increase is usually lost before another year comes around. This is the reason why in spite of reproductive potentialities, cottontails nevertheless require conservation measures and strict enforcement of conservation laws, if the rabbit hunter is to continue to have quarry to hunt.

A startling example of tremendous rabbit multiplication followed by catastrophic decline is provided by a study of introduced cottontails on an island in New York. "Lacking ground predators, the rabbit population skyrocketed. Attempts to reduce them by shooting and the payment of bounties were unsuccessful. Following moderate reduction by winter starvation, considerable mortality accompanied by tick infestation occurred. Technicians determined that losses resulted from tick-induced anemia or bacterial infections. Additional losses among juvenile rabbits occurred when they were abandoned by sick or dying parental females."

The history of the introduction of the rabbit into Australia is a classical, probably the most spectacular, example of violent transformation of an elsewhere useful animal into a hideous pest.

Australia originally had no rabbits. Indeed, until the coming of man.

Domestic rabbits were introduced into Australia in 1787, were reared, were released, but did not spread.

This gift came to cost Australian economy an estimated $12,500,000,000.

Rabbits had no serious Australian enemies to control them. Soon a pest, they became quickly a peril. Thousands of miles of rabbitproof fence—each kept clear of trees and shrubs along a wide zone on each side—were built. Every then-known device to reduce rabbit populations was used and failed. Today Australia must build 300,000 miles of new and atrociously costly rabbit fence and block off with swinging steel net gates all streams such fences cross (for rabbits swim well) and carry out effectively a systematic program of extermination over more than 2,000,000 square miles of area.

The cottontail in spite of his small stature is one of the great figures in our pattern of wildlife. Wide ranging and eagerly sought by hunters for both sport and food, "Brer Rabbit" has become an integral part of our legend and folklore. In pite of his wiggling nose and shivering body, he can, in an emergency, become tough and has desperate courage.

The part that the cottontails play in the game pattern of mammals sharply parallels in importance the role of quail among bird game. It is quite convenient that game management practices, useful for improvement of cottontail hunting, also equally improve quail hunting.

The cottontail crop annually harvested in the United States is enormous. Estimates for 1938 covering only four states showed that year's cottontail kill as Michigan, two and a half millions; Pennsylvania, three millions; Ohio, four millions; and Missouri, four and a half millions. This totals fourteen million cottontails for these four states alone for that single year.

Cottontails serve as food for every flesh-eating mammal and bird that can catch them. They are also subject to a heavy car kill on highways.

Unequipped with the jack rabbit's higher leaping abilities, cottontails depend on their bursts of speed over short distances, and their expert "broken field running."

When the cottontail decides to "freeze," its wonderfully camouflaged color melts into the background and often saves his life.

Individual home range of cottontails varies with latitude because of seasonal changes of winter food supply in northern states and varies everywhere with abundance of food and cover. Food alone, obviously, does not suffice as satisfactory territory. No shelter means no rabbits.

Territory is something that must be fought for. Any invading females are immediately attacked and the area becomes the range of the winner. Cottontails occupy "forms" during the day which may include all manner of constructions or natural shelters. Brush piles, as every hunter knows, are favorite choices.

Cottontails also serve the interests of both the hunter and the farmer by acting as "predator buffers." By satisfying the hunger of predators, they relieve predator pressure on other game and on the farmer's poultry. Thus, although they themselves are game, they serve to save from predators more valuable species for the sportsman.

Rabbits, like other wild game, suffer from many diseases. It is interesting to note that the first rabbit parasite was described 276 years ago.

Wild rabbits also are hosts to such external parasites as fleas and ticks.

Warble flies also infect rabbits and their larvae may sometimes be found under the skin.

Rabbit hunters are, however, most greatly alarmed about bladderlike cysts which occur along the intestines and kidneys of the rabbit and are actually a stage in the life history of the common dog tapeworm. If these cysts are eaten by dogs which are fed uncooked rabbit entrails, they proceed with their development in the new dog host. Also present in rabbits are the true rabbit tapeworms in the rabbit's intestines. The presence of these two parasites does not in any way injure the rabbit for use as human food.

It is important, however, that mention should be made here of an extremely serious rabbit disease known as tularemia. Caused by a bacillus (the technical name of which is *Pasturella tularensis)*, tularemia was first discovered in 1906 in Tulare County, California, from which it received its name.

Tularemia is an extremely serious human disease contracted when the blood or flesh of an infected rabbit comes in contact with scratched or otherwise broken skin.

Tularemia affects a wide range of birds, mammals and even reptiles, including house mice, house rats, squirrels, chipmunks, opossums, cottontails, and other rabbits and hares, skunks, muskrats, foxes, domestic cats, domestic dogs, sheep, deer, quail, horned owls and bull snakes. Rabbit ticks, deerflies and, in experiments, fleas and muskrats have been found capable of transmitting the disease from one rabbit to another. Human infection, however, is apparently chiefly due to careless handling of the infected rabbits themselves. The disease has been contracted by enforcement officers of the Louisiana Department of Wild Life and Fisheries in the course of their duties.

Tularemia is often wrongly diagnosed and for that reason it is desirable to set down here some facts concerning this malady. Symptoms, which appear from two to nine days following infection, resemble in general those of influenza. Five types of tularemia have been recognized in man, some simulating typhoid fever; others, pneumonia.

Tularemia can be a fatal human disease. Formerly, it was much more dangerous than now, since the use of new antibiotic drugs has greatly reduced mortality. Tularemia, however, is still a serious hazard. These statistics, secured from records of the Louisiana Department of Health and the United States Public Health Service, provide an impressive warning to rabbit hunters to dress rabbit meat with care. Rarely more than one rabbit in one hundred is infected.

Tularemia is a reportable disease. The total number of cases of tularemia in Louisiana for the period of 1945 through 1949 was two hundred and twenty-two.

It happens that the national figures are not available for all of these years. Therefore, to provide a comparison, total cases in Louisiana and total cases in the nation are given for the following years:

Year	Total Louisiana Cases	Total U. S. Cases
1945	28	818
1946	43	1,177
1947	57	1,360

The chief precautions which should be observed are obviously, first, that rabbits should be handled with care during preparation and particularly that instant cleansing of any accidental cuts incurred during such operations be sterilized as thoroughly as possible; second, that all rabbit meat be thoroughly cooked both to destroy the cysts already described and to sterilize any tularemia infection that happens to be present. It should again be pointed out that the eating of even infected rabbits under such conditions is incapable of harm. The fact that such infection does exist should in no way impair the rabbit hunter's enthusiasm.

Cottontails suffering from tularemia have a generally sickly, sluggish appearance. The liver is spotted and the spleen usually both spotted and enlarged.

The best precaution against tularemia (in addition to avoiding the exposure of cut surfaces to the flesh or blood of the rabbit being dressed) is that the hunter leave strictly alone all sick looking rabbits.

Rabbit fur is used in the manufacture of felt hats and, also, when dyed, has been used under the trade name of "electric seal" and also "seal dyed coney" in the manufacture of fur garments. The use of such phony fur names is now illegal under federal law. The fur is fragile, rating only 5 per cent when the arbitrary standard of otter fur is taken as 100 per cent.

THE BOBCAT PREDATOR

A bobcat looks somewhat like an overgrown, somewhat tailored house cat with its tail chopped off, but if anybody confuses the tolerant docility of the one with the vicious fury of the other, he is quite unfamiliar with *Lynx rufus floridanus,* which is the scientific name of our particular bobcat.

Commissioner Clements' estimate of the role of the bobcat as one of our worst destroyers of such valuable game as quail, the turkey and the white-tailed deer was recently well confirmed when the most eminent national authority on these subjects, Stanley P. Young, paid a visit to Louisiana and discussed these matters.

Bobcats are stealthy, vicious animals, often heard, seldom seen. They are cousins of the northern Canada lynx which is distinguished by its larger feet ("snow shoes") and the lynx's sharp disdain for man as a neighbor. The bobcat, less in size than the lynx (38 inches with a 6 inch tail and a height of 15 inches as against the lynx's 3 foot length and 4 inch tail and a height of 18 inches), nevertheless reaches the equivalent weight of 40 pounds.

The bobcat, unlike the lynx, is astute enough to live near man and feed at man's table. The lynx ranges east of the Mississippi only south to New York and northern Michigan; the bobcat lives in woods or brushy country, and in Louisiana also in swampy areas, from Nova Scotia to British Columbia, south to Florida and California.

Dr. George H. Lowery, Jr., the authority on the distribution of Louisiana mammals, states that our common Louisiana bobcat is the so-called Florida bobcat *(Lynx rufus floridanus)* to which he gives the range as "fairly common throughout the alluvial swamps of eastern, southern and southeastern Louisiana." One record of another "race," the Texas bobcat *(Lynx rufus texensis)* is reported by him from Natchitoches Parish. It should be noted that the bobcat belongs to the same family, the cat family (Felidae), to which belong our domestic cat (a most destructive predator of game) and also the puma or mountain lion, which apparently may still survive in wild river bottom areas of our state.

Bobcats congregate and flourish where the food supply is high, where game is abundant or where, for example, in the deep south, wild hogs are numerous and provide abundant food. It is recorded that a single bobcat killed thirty-eight lambs in a single night.

The bobcat is capable of destroying efficiently even adult white-tailed deer, our Louisiana deer. A 20-pound bobcat has been recorded as having killed a 200-pound buck. Fawns are clearly easier prey. The attack technique when a full-grown deer is concerned is that the bobcat leaps on the deer's back, after cautiously trailing its prey, bites through the jugular vein, often high in the throat, and stays with its dying victim. One case is noted where bobcat and buck deer fought for five hours before the deer was killed.

Bobcats are one of the worst enemies of one of the finest game birds of North America, the wild turkey. Because of their ability to climb trees, bobcats can sate their appetities for domestic turkeys as indicated by one example where a flock of twelve fine, large domestic turkeys took to roosting in low trees and in one night bobcats killed eleven.

The technique of the bobcat in stalking the wild turkey is thus described by acute observers:

"The method of stalking used by both the bobcat . . . is well illustrated by the following observations. On November 21, 1939, a turkey hunter flushed a flock of wild turkeys near Crummets Mill, Highland County, and was yelping them when he heard something stealthily approaching him. Assuming that the approaching animal was a turkey returning to his yelping, the hunter yelped once more very quietly and then awaited development. After several minutes of carefully watching the area where he last heard the movement in the leaves, the hunter observed a bobcat stealthily approaching and searching the region carefully, apparently looking for the yelping turkey."

Bobcats kill and eat almost any available game or domestic animals, but educated bobcats pay no attention to skunks. Skunk attacks must be ascribed either to young bobcats or bobcats that are mad with hunger. The bobcat apparently uses its keen eyesight rather more than its still really good sense of smell.

Bobcats are seldom seen because of their ability in concealing themselves and their dominantly nocturnal habits. Their motions, oddly enough, are also "bobbing," as well described by one observer as "bounding away with almost rabbitlike motions, rather than with the smooth, soft running of the bushy-tailed animals, such as foxes and coyotes. Even at a distance they may be distinguished by their bobbing motion as they run. Though they show considerable speed for a short distance, they cannot continue a long rapid flight. Usually they are quickly treed or run to cover by an ordinary dog and on good ground are easly overtaken by a man on horseback. Rabbitlike, they generally lie closely and depend on seclusion rather than flight."

The life history of the bobcat can be compactly described.

Bobcats mate early in the year. The young, one to four of them, being born about fifty days later.

Usually relatively silent and self-effacing, the bobcat's love life elevates it to a vocal preeminence for, as well described, bobcats "mate in January to late February. At this time, the animals outscream themselves. They squall and yowl like overgrown alley cats. They have a varied repertoire, with astounding range and volume. As soon as a male has achieved results from a successful serenade, he goes on his solitary way to further vocal and amorous triumph, that is, if he can find another female that is free or can be taken away from her current mate. As a rule, the bobcat is a rather silent animal. When approached in a trap, it first growls, then, baring its teeth, spits and hisses ferociously."

The tabby bobcat feeds her young, which remain blind for nine days, for at least two months, while the tom bobcat stays at home and helps her care for them. Kitten bobcats are easily tamed and by the first autumn of their lives weigh 8 to 12 pounds, but thereafter they change their weight and their dispositions.

Since access to trapping instructions are not easily available, there are here given suggestions as to sets and baits to be used. These are derived from Stanley P. Young, based upon his decades of experience in controlling predators.

"Bobcats are easily caught in traps of the common double-spring steel type, in sizes 2 and 3. . . .

"In selecting a site for trap sets, one should be guided to a large extent by the tracks of the animal. . . .

"When the trail of a bobcat has been found, by track or sign, along, or leading from its rocky lair, traps may be placed in either double or single sets. If the trail is not frequently used by livestock also, or by such big-game animals as deer, the so-called 'blind' trap set may be employed. This set is called a blind because no lure or scent need be used around it when completed. . . .

"Whether single or double blind trap sets are employed, they should be placed in holes dug directly in the trail of the bobcat close to such an obstruction as an exposed rock, or a clump of weeds, for the bobcat seldom fails to step over rather than on such an obstruction in its path. If the double set is to be used, the trap holes should be only about 1 inch apart, separated just far enough to prevent interference of the jaws when the trap is sprung. . . .

"A scent attractive to bobcats may be used to advantage to lure the animal to trap sets. When scenting is resorted to, however, the traps should not be placed in the runway proper, but on either side of it, or on one side only. and parallel to the trail. They should be set in the same manner as described for the blind sets, between the trail and the spot selected for scattering the scent. . . .

"The basis of the scent may be any kind of fish, but oily varieties, such as sturgeon, eels, suckers, and carp, are preferred. The flesh should be ground in a sausage mill, placed in strong tin or galvanized-iron cans, and left in a warm place to decompose thoroughly. Each can must be provided with a small vent to allow the escape of gas, otherwise there is danger of explosion. The aperture, however, should be screened with a fold of cloth to prevent flies from depositing eggs, as the mixture seems to lose much of its scent quality when maggots develop in it. This preparation may be used within three days after mixing, but it is more lasting and penetrating when it is about a month old. . . .

"Oil of catnip, diluted in the proportion of 35 drops of the pure oil to 2 ounces of petrolatum, has proved an effective lure in bobcat trapping.

"While digging holes for the sets it is well for the trapper to stand or kneel on a 'setting cloth,' which is made of canvas or a piece of sheepskin or calf hide about 3 feet square. The dirt removed from the place where the trap is bedded may be piled on the setting cloth. Surplus dirt not needed for covering the trap should be scattered evenly on the ground at some distance from the set. It is well also to wear gloves while setting traps, and to use them for no other purpose.

"When received from dealers or manufacturers, traps frequently smell of grease, perspiration from human hands, or other odors caused by contact with various kinds of merchandise in the course of shipment. . . . Simply burying the traps for a few days in a manure pile (the odor from which does not arouse the predator's suspicion) will often remove all other odors."

Young believes that one bobcat is actually the equivalent of one wolf in the measure of its destruction.

THE BROWN PELICAN

The brown pelicans of all subspecies appear to be essentially marine birds, whereas the white pelican prefers, if anything, fresh water for its habitat.

The most recent world survey of the relationships of birds is the work of Peters, who decides that the specific order (an order is one of the largest divisions in the cataloging of birds) named the Pelecaniformes, which includes the pelicans, is made up of some of our most interesting Louisiana birds, several of which will later be referred to in more detail. The families included in this order are the tropic birds, the pelicans, the gannets and the boobies, the cormorants, the Mexican snake birds and the man-o'-war birds, known elsewhere in the world as the frigate birds.

Two species of pelicans occur in Louisiana, the brown pelican, whose now recognized five subspecies range all the way from North Carolina to central Chile.

This fine portrait by Francis L. Jacques shows the typical flight of the Eastern Brown Pelican, the characteristic plunging position in fish catching, also a bird at rest and two birds exhibiting their usual buoyant swimming position while in the background a small part of the Pelican colony can be seen nesting on mangroves. Top and to the left fly three Man-o'-War birds, "cousin" of the Pelican and a familiar bird to Louisiana Gulf Coast fishermen. **(After Arthur H. Howell.)**

Our particular state bird has a normal breeding range from the Carolinas to Texas. At least as far as Mississippi is concerned, it is loyal to Louisiana, since: "There is no known instance of the brown pelican nesting on the Mississippi coast; the closest breeding colonies are in the Chandeleur Islands, Louisiana."

The brown and white pelicans exhibit a sharp contrast inasmuch as the first species chooses marine breeding grounds, the second, typically far inland. The writer has found the largest concentrations of brown pelicans in Louisiana at North Island on Chandeleur Sound, at the mud lumps off Main Pass and at Timbalier. The factors that decide the establishment of a brown pelican colony do, the writer believes, chiefly concern the impact of storms and the rise of storm tides during the critical period when the nests are being built. An additional factor, the writer has observed, is the accessibility of the pelican colonies to predators, particularly the raccoon. Raccoons can swim expertly and have become enormously abundant along the Louisiana Gulf Coast because of the low price recently paid for 'coon skins (the average price per pelt for the 1949-50 trapping season was 27 cents). 'Coons are extremely fond of eggs and young birds, and are quite capable of wiping out a bird colony if they are present in considerable numbers.

The feeding of the next generation of our state bird is a complicated matter. These Brown Pelicans were **photographed by Dr. A. M. Bailey** on Mud Lumps off Main Pass, Louisiana.

The white pelican in contrast is a bird of fresh water nesting habitat. Although the writer has noted flocks of as many as 250 white pelicans during late June, the normal breeding period of this species, not a single authentic breeding record is available for Louisiana although it does nest in Texas.

North Island in Chandeleur Sound probably provides one of the most typical and abundant brown pelican colonies in the whole state. The birds typically nest on black mangroves (also called honey mangroves), the technical name of which is *Avicennia nitida*. This shrub, which occupies saline waters, commonly attains a height of less than 6 feet. The sight of the congested and compact brown pelican colonies on the low honey mangroves in such a situation as North Island is unforgettable. The birds are capable of concentrating their nesting activities because of their competent fishing skill and their high powers of flight.

Brown pelicans normally lay three eggs, sometimes four and most rarely five, the last probably from two mothers. Dull, lusterless, with a rough granular surface, the eggs quickly become stained and progressively more filthy, and are laid in a quite well constructed nest. Sometimes the nest is built on the ground on small islands where storm tides wash away the eggs. Often, because of the usual coastally exposed situation of the nesting colonies, heavy storms completely wipe out nests and eggs or nests and young. Frequently, also, there recur sweeping pandemic diseases which may destroy the entire population of adults and leave the young to starve. The actual pathological cause of these disasters is not by any means understood and may be quite various.

The pelican is quite a large bird. Its name is long—*Pelacanus occidentalis carolinensis*. Ranging from 44 to 56 inches in length, it has a spectacular wing spread of 6½ to 7 feet.

Pelicans are extraordinary animals in their flight. Weather fine, they may fly high. Weather bad, they fly above the crests of the ocean waves. They have a strange manner of flight. They fly in a fashion that recalls the pterodactyls, those extraordinary flying reptiles that existed above five hundred million years ago during the period of the earth's history that is known as the Cretaceous.

The adults are absolutely dumb. The young are evocative.

The young enter their life clad in a black skin, than which nothing could be worse for survival. When through circumstances, their parents are away, they can die from heat stroke in a matter of ten minutes.

Birds often execute quite elaborate ceremonies in "changing the guard" where both parents contribute to the operation of incubating the eggs.

It is to the writer an extremely remarkable fact that before the young are born (hatched from their shell), they begin to call for their parents.

The confusion of a pelican colony cannot easily be described. With the young still loquacious and using every vocal device to state that they are starving to death, they become so completely mixed in roving flocks that since they are so similar in appearance it would seem impossible that their parents do identify and feed them. The explanation appears to be that the offspring are identified by voice and at the same time the young in some way certainly not yet ascertained do reciprocally identify their silent parents. It is the surmise of the writer that some supersonic vibration may be used by the parents. The investigation of this would involve a highly complicated piece of technical research that might or might not add something of value to the sum of human knowledge.

The vocal pattern of a brown pelican nesting colony is extraordinary. The young, always hungry when wakeful, emit continuous outcries for food.

The immediate domestic life of the brown pelican involves many odd characteristics since the birds are subject to such severely high temperatures that they actually have to flap their "pouches" as a mean of getting enough oxygen and perhaps in some measure cooling themselves off. The writer recorded the temperature on the sand in the middle of a brown pelican colony on North Island, Louisiana, in late June and found that it read 143° F.

Pelican eggs hatch in about thirty days.

The fishing techniques of the brown pelican and the white pelican are completely different. The brown pelican is a lone individualist seeking singly his own prey. The white pelican fishes by cooperative surface swimming, a coordinated procedure that singularly reflects the pattern of a seining crew. From a semicircular line, the white pelican will drive the fish before them and secure their prey from the constantly more concentrated school.

The fishing of the brown pelican, familiar to everyone on the Gulf Coast, is an unforgettable example of the quick vision of birds. Cruising along often at a considerable height, the pelican is capable of perceiving with precision the presence of the fish it seeks. Thereafter, the skill displayed is amazing. Descending from as much as 60 feet above the water, the brown pelicans hurtle:

> ". . . usually spiraling or twisting on their downward course so that they struck with their backs rather than their breasts toward the surface. In other words, they would be gliding upside down, with the wings still half spread, at the instant before the plunge. Usually they quite disappear, even to the tips of their long wings."

As soon as pelicans reappear at the surface, they turn down the bill to drain the pouch which may hold "seventeen pints" of water, after which they toss up and open the bill so as to release their victim, only to receive it in the throat and swallow it with a gulp.

The food of the brown pelican is chiefly made up of members of the herringlike fishes, particularly the menhaden, which abound in the Gulf of Mexico. Mehnaden are of no interest whatsoever to sportsmen since neither do they form the food of sports fishes nor do they serve themselves as sportsmen's quarry. Menhaden, however, have become spectacularly the greatest fishery in volume in the entire western hemisphere. With a total production last year in the United States of America of over 1,250,000,000 pounds.

The pouch of the pelican is used to catch, not to carry, its prey. The food for the young is borne in the gullet into which the nestlings plunge shoulder deep to secure their meal. They create a great uproar while feeding, but are so greedy that they become, because they are so stuffed with food, semiconscious and lay their heads on the ground while their parents leave them and go bathing and characteristically soar in the air.

One competent observer noted that a mosquito plague at the Pelican Island, Florida, colony compelled the brown pelicans at the height of their breeding activities to abandon 600 nests containing young birds. It seems hardly believable that mosquitoes alone could have caused this behavior.

The eastern brown pelican had an old Acadian name, "grand gosier," which was registered in Louisiana geography as a name of an island which is part of a long chain of state and federal bird refuges extending from Chandeleur Island to Breton Island.

LOUISIANA PHEASANTS

This discussion has the purpose of relating the introduction and spread of the ring-necked pheasant (the technical name of which is *Phasianus colchicus torquatus*) in North America.

The recent success of private hunting operations with privately reared birds in Mississippi has brought about the implication that the Louisiana Department of Wild Life and Fisheries has been ignorantly neglecting the possibilities of this magnificent game bird as a species valuable for introduction in our state. Any Louisiana hunter who has hunted pheasants in their center of greatest concentration in the United States, the Dakotas, naturally is confused when he hears of pheasants being raised successfully in our latitude and yet notes that this species is omitted from our game program.

The male Ring-Necked Pheasant. This beautiful introduced species, one of the handsomest game birds in the world, has become astonishingly abundant in the Dakotas and adjacent states. Nowhere in the Deep South has it become successful as a game bird where released "on its own."

Far from being ignorant of the status of the ring-necked pheasant, this department (then the Louisiana Department of Conservation) first began the experimental raising of pheasants on Avery Island thirty-five years ago when, under date of March 17, 1916 (Conservation Commission of Louisiana, 1916), the late M. E. A. McIlhenny, in his report on the state game farm, related that twenty pairs of pheasants were secured as breeding stock in 1915 and suggested the pheasant as a possible source of profit if artificially raised by farmers and marketed. Two hundred and twenty-seven pheasants were reared the first year. This first report, filled with optimism, did, however, emphasize the value of the pheasant as a cultured bird rather than a game bird in the wild.

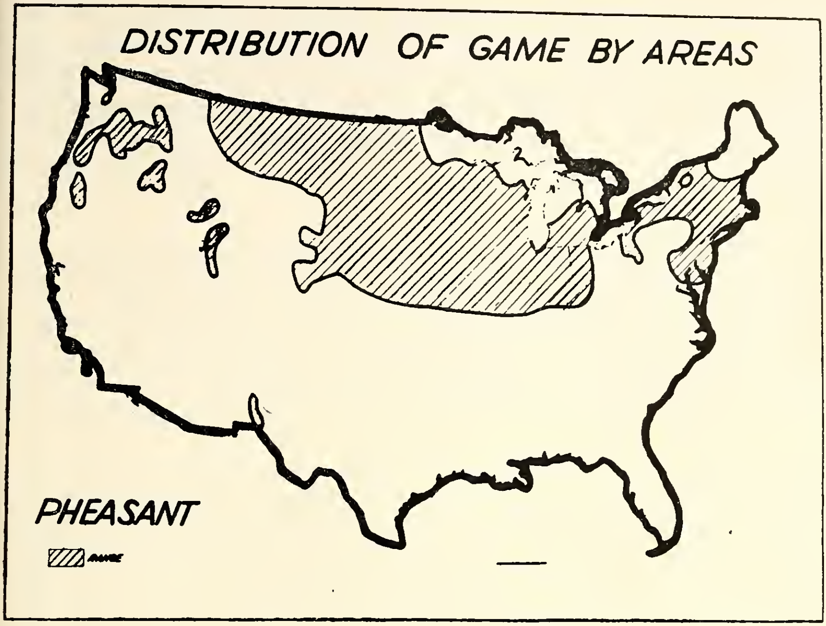
It should be noted with care that the subsequent report, "The Report of the State Game Farm," (Conservation Commission of Louisiana, 1918) Mr. McIlhenny makes no mention of any success of the pheasant as a game bird.

It is particularly to be noted that no mention whatever is made in the next biennial report (*Fourth Biennial Report*) of either the ring-necked pheasant or the game farm.

Oberholser reporting in 1938 stated, "Attempts to introduce this species into Louisiana have apparently so far been unsuccessful, as the bird has not yet been fully established in any locality. The birds have been introduced on Marsh Island, also in LaSalle Parish, and on the state forest, but so far as the writer is aware there are no breeding birds in the wild state now left at any of these localities."

Now, to revert to the history of the ring-necked pheasant. The original range of the pheasant was eastern and southeastern China from Canton to Hunan, north to the lower Yangtse and north to Peking.

Pheasant stock introduced in the United States came from England, where they were introduced from Asia Minor one thousand and five years ago, at the time of the Roman Conquest. Among the earliest attempts to introduce the pheasant into North America was that made by Benjamin Franklin's son-in-law, Richard Bache. It was introduced in New Hampshire in 1790, New Jersey in 1800, California in 1857 and Oregon in 1881. Friedmann states further, "Introduced now and fairly well established in approximately the northern half of the United States and in southern Canada." He gives the present range as extending from portions of southern Canada and southwestern Maine south to Maryland, Pennsylvania, Ohio, Kentucky, Kansas, Colorado and California. Phillips, 1928, a profound student



Game range of the Ring-Necked Pheasant. This map (after Gresh, see bibliography at end of article) based on most recent information shows clearly the areas in the United States where the Ring-Necked Pheasant is shot as a game bird in the wild.

of the introduction of foreign birds into the United States, remarked at that time that although the pheasant thrives in the north, south of Baltimore and Washington its introduction was until then unsuccessful since "the stock does not hold out long if thrown on its own resources."

Here reproduced from Gresh is a map showing the approximate range of the occurrence of the pheasant as a game bird in the United States. A glance will show how far north the successful range is from Louisiana.

The validity of this approximate mapping is sustained by the recent extremely important report, "Ten Years of Pittman-Robertson Wildlife Restoration" (Rutherford, 1949). Pittman-Robertson funds totaled a Federal revenue of $48,175,431 collected between July 1, 1938, and June 30, 1948, as an excise tax on sporting arms and ammunition. Administrative officials controlling these activities represented the top-flight experts in the country and each project was subject to the most careful scrutiny.

It is obvious, therefore, that any reasonable possibility of development of the pheasant as an introduced game bird in the wild in the southern states would not have been overlooked. Rutherford states, "This exotic (the ring-necked pheasant) has succeeded so well in the northern agricultural regions that it now has surpassed native species in importance in wide sections of the country."

Of utmost significance is Rutherford's further remark, "Heavy stocking of pheasants from game farms is still being done in some states, but studies have shown that most of this is time and money wasted, unless the birds are released immediately ahead of the gun. This latter practice is not restoration, and cannot be approved as a Pittman-Robertson activity."

No clearer statement of the futility of breeding pheasants (and then turning them loose in a habitat where they will not survive and have never been demonstrated to survive under completely wild conditions and in uncontrolled areas) could possibly be found.

It is difficult to comprehend the extraordinary success of pheasants in certain of the northern states. South Dakota, (Gresh) presumably reporting for the year 1945, gave the kill of pheasants in South Dakota alone for the last single reported year as 6,350,000. It is almost unbelievable that all of these pheasants came from 2,300 birds which South Dakota purchased from an Illinois game farm and introduced into South Dakota. South Dakota has never owned a game farm. Compare with this the reported kill in Louisiana for the same year of 1,610,000 ducks and 25,000 geese. The following are the pheasant kills reported for the same year for these states: Illinois 270,000, Iowa 700,000, Michigan 1,401,000, North Dakota 1,445,000 and Nebraska 2,000,000.

Pheasants have been at various time introduced by various people for direct release in the State of Louisiana and, as far as the writer has been able to ascertain, this species when put on its own, fails to succeed. What factor or factors destroy it are not known, but the writer surmises that one element of importance may possibly be the existence of ticks and red bugs, the absence or presence of which apparently has relationship to abundance of certain game species.

It may be significant to note that in 1934 the State Game Commission of Mississippi released thirty-three pheasants in the State Teachers' College Refuge in Forrest County and in 1938 introduced an additional one hundred birds into Mississippi and as a result of these experiments stated, "These birds seem not to be able to hold their own under conditions existing in this state."

Two other unsuccessful deep south pheasant introductions are reported (Phillips, 1928) as follows: "On Jekyl Island, off the coast of Georgia, for instance, pheasants were tried out many years ago, even before 1888, but none now remain. The same is true of the region about Thomasville, Ga. They had a fair trial in Alabama about fifteen years ago."

It should perhaps be added that another species of pheasant, our common guinea hen, the official book name is the gray breasted helmet game-fowl (the technical name of which is *Numida maleagris galeata*), a native of Africa and Madagascar, has been introduced into Cuba and other West Indian islands where, established as a wild bird, it now provides good hunting. The familiar wandering habits of the guinea hen have certainly given it every chance to become acclimated to Louisiana which, whatever the factor or factors that prevent this, it has never done. Still further, as a concluding remark, it should be noted that our breeds of barnyard chickens are descended from another member of the pheasant family, the jungle fowl of India, *Gallus gallus bankiva,* and they likewise, as well as the original wild jungle fowl, have never successfully taken completely to the woods in the United States of America.

THE WHITE IBIS

The subject of this discussion is the role which the white ibis plays in the pattern of life in some of our Louisiana areas.

The white ibis is one of four species of ibises that have been known to occur in the State of Louisiana. It belongs to a family, technically the Threskiormthidae, which includes both the ibis and the spoonbill, and which is closely related to another family, the storks and wood ibis, technically the Ciconiidae, which latter family contains the wood ibis, our only North American true stork.

The adult white ibis is about 2 feet long with a somewhat more than 3-foot wing spread and about a 6-inch bill. The bill is curved downward, typical of the ibises, but this characteristic cannot always be seen easily in flight. The bird is white except for the blackish tips of the primaries which are somewhat iridescent with blue. The birds' bare skin of face, legs and feet is, according to season, bright carmine or orange red. Young birds differ greatly, being hair brown on the neck and head with dull white streaking, fuscous on wings and tail and white underneath.

The other three species of ibises that occur in Louisiana are the eastern glossy ibis, which is a dark colored bird shot with metallic greens and purples, the white faced glossy ibis, similar to the glossy ibis except that it has white feathers around the base of the bill, and, lastly, the spectacular scarlet ibis, which, the size of the white ibis, is completely a startling blaze of flame in its plumage.

The white ibis has a peculiar flight, rapid and well sustained, with alternate synchronized periods of sailing. The morning and evening flights from the rookeries to the feeding grounds disperse the white ibis far and wide, the birds characteristically flying either in a broad column or in single file. The white ibis has, also, another peculiar flight behavior wherein an entire flock will ascend high in the air and continuously circle as a mysteriously coordinated unit, then suddenly pluge close to earth at high speed.

The white ibis, like cranes and storks but unlike herons, fly with their necks fully extended and can, therefore, be readily distinguished from our white herons, such as the snowy and American egrets and the young of the little blue heron.

The white ibis has increased greatly in local concentrations during the past two decades, as the writer has personally observed. Dr. Harry Church Oberholser, in his *The Bird Life of Louisiana,* stated twelve years ago that the white ibis was "a rather rare permanent resident in southern Louisiana, from Cameron Parish, Avery Island, and New Orleans, north to Lake Pontchartrain, Bayou Sara, Lottie, and Toomey. It breeds in colonies with herons of various species, but only a few of such nesting groups now remain, for it is apparently much less numerous than formerly."

White ibises are sharply gregarious birds. Although they often nest with other species such as the herons, even in such colonies they usually maintain their own sectional territories. Some concept of the size of these colonies may be gained from citing specific examples. One white ibis rookery in Florida included 6,000 nests, another Florida rookery contained 100,000 birds and still another Florida rookery was populated by the astonishing number of 600,000 birds. The neighborliness of the white ibis is indicated by the fact that Oberholser describes an instance of fifty nests being placed in a single tree

The location of the white ibis colony is determined chiefly by the proximity of suitable nesting sites (mangroves, cypresses or other vegetation) to a sufficient food supply. So voracious are the white ibises that their chief food, the crayfish, may be exhausted over a wide radius, compelling the birds to carry out long morning and evening flights to and from their feeding grounds. The writer has repeatedly flown over the two huge white ibis colonies near Manchac, which are mentioned below, and has been profoundly impressed by the memorable pattern of the great numbers of glistening white birds flying their formations and at evening converging to the rookery from surprisingly long distances.

The contamination produced by a white ibis colony is so great that frequently it will completely destroy all the vegetation and compel the white ibises to seek a new home each year.

The white ibis builds a loosely constructed nest of dead twigs, usually lined with green leaves, and a great deal of Spanish moss. The two to five (usually three or four) greenish-white eggs spotten with varying shades of brown hatch in three weeks. When only partly grown, young white ibises become young Tarzans and take to the bushes and trees, often scattering over considerable distances and adding to the difficulties endured by their parents in keeping the family well fed.

Repeatedly, within the last few years, the writer has received complaints of the rapid expansion of white ibis colonies, particularly two huge colonies located north of Manchac. The writer has made repeated observations of those colonies and can state that the reports of their magnitude were not exaggerated. The people who live in the area believe that these always hungry white ibises are so abundant and so voracious that they have caused a serious and steadily mounting decrease in the crayfish population. Crayfish form the chief food of the white ibis in such areas. Grasshoppers, other insects and small snakes are also eaten. One observer counted 1,391 crayfishes in the stomachs of 194 white ibises examined. This destruction of crayfish, the local residents believe, may form a significant and damaging change in the animal relationships of the area since crayfish form the favorite and chief food of the mink not only in Louisiana but throughout the country.

They, therefore, believe that some measure of control to reduce the white ibis population is desirable. When the rate of expansion of these colonies is considered and observation is made of the extent and pressure exerted by the foraging of the white ibises, particularly during the breeding period when they have to feed not only themselves but their rapidly growing young, the simplest calculation of the number of crayfish needed per day inevitably indicates the destruction of enormous numbers of crayfish with a corresponding impact upon the other animals, mink, fishes and many other, for which crayfish form important fare.

The glossy ibis, at least when it lives along the Louisiana coastal areas (the writer has personally observed), also feeds chiefly and often exclusively on a crustacean, but in this instance it is the fiddler crab, an animal of peculiar fecundity and one which is valueless as a human food.

There is still another factor that may be of importance which is now under investigation by the Public Health Service of the United States government and that is the possibility that the white ibis may harbor the virus that causes the disastrous disease known as equine encephalomyelitis. This malady, which years ago killed some 30,000 horses in Louisiana, and the next year killed some 18,000 horses and which, in addition, took in a year some twenty human lives, may pass part of its cycle in the white ibis. This matter is now under scientific investigation and no conclusive results have yet been obtained, but should it prove that this suspicion is based upon fact, remedial action would of necessity be planned and executed.

It must here be emphasized that the white ibis is strictly protected and that any control measures would absolutely be required to be carried out under special instructions.

Such special measures for relief by the control of protected birds have previously been accomplished. Two examples may be cited. First, the control of the herring gull in Maine, where deliberate destruction of the eggs by various chemical means was successful; second, the case of the fulvous tree duck in southwestern Louisiana, where the owners and agents of the rice growers, under special permit, destroyed these birds by the use of firearms.

Other control measures might possibly be effective without involving actual destruction of eggs, of young or of adult white ibises.

Many competent nature lovers whose primary interest is concerned with birds will almost, as a conditioned reflex, oppose any measures that will disturb the domestic bliss of any birds and will argue that drainage with its consequent lowering of water table has been the central agent in reducing crayfish populations. This argument, however, is a two-edged sword for it is correspondingly clear that as crayfish populations have been reduced through the operation of this or other factors, there is a consequent parallel need for the greater protection of the crayfish that remain.

The writer must again emphasize that although it may at first seem peculiar that a conservationist should believe reduction of such a bird population a measure to be recommended, nevertheless all of these factors must be cautiously considered and carefully balanced before any blanket decision or recommendation is made.

POSSIBILITIES OF FROG FARMING

No week passes in which the writer does not receive requests to provide information on how bullfrogs can be "farmed" with high commercial profit.

Broadly stated, the answer is that after some twenty-five years of personal familiarity with the bullfrog throughout its natural range from northern Nova Scotia to the Gulf of Mexico, the writer has yet to be convinced that any money can be made in the operation of bullfrog farming. The bullfrog, the technical name of which is *Rana catesbeiana,* is a species of wide range and is the bullfrog of commerce. A second species, *Rana grylio,* occurs in the Gulf states. It is much less important because it is smaller and it can be distinguished as indicated below from the ordinary bullfrog.

The common bullfrog is yellowish-white underneath whereas the southern bullfrog usually shows a black, brown and yellow network on the under parts.

A number of much smaller species of frogs are used for food in the northern states but they contribute negligibly to the frog leg market.

Bullfrogs, like other frogs and quite unlike many important species of fish, are not sociable creatures. When confined in numbers in concentrated areas, they have, in the observation of the writer, completely failed to multiply in any satisfactory productive manner. Furthermore, under such artificial conditions of propagation, the great number of parasites and other diseased conditions to which frogs are subject increase beyond control.

It is significant that certain nationally advertised schemes for raising bullfrogs primarily involve the sale at excessive prices of so-called special "breeding stock" which the writer after personal investigation has never found to be any other than ordinary native bullfrogs. These reputedly special strains to the personal knowledge of the writer were not even bred by the people offering them for sale but were simply captured wild native bullfrogs sold at exorbitant prices.

It is also significant that certain of these most widely advertised schemes for raising bullfrogs have been subjected to the severest scrutiny of the United States Postoffice Department with, as a result of such investigations, the indictment of certain of these companies under federal law for using the mails to defraud.

The writer served as chief biologist of the former Department of Conservation, now designated as the Department of Wild Life and Fisheries, for the past twenty years and during that time has never discovered any profitable artificial bullfrog farming operation. All the bullfrogs that have been marketed have to his knowledge been captured as native animals in the wild state.

Extensive inquiries by the writer have failed to reveal any considerable market in canned frog legs.

The market for frog legs is decidedly a luxury market but they are usually simply processed by freezing. The supply apparently simply cannot meet the needs of the market and on occasion frog legs have been imported into the United States from Cuba.

A sharp distinction must be made between, first, the attempts to rear bullfrogs artificially, and, second, the stocking of areas suitable for natural bullfrog growth. The second procedure may well result in a good crop of bullfrogs under natural conditions.

The sexes in the bullfrog are very readily distinguishable. The thumb of the male is very much thickened at the base whereas the thumb of the female is slender.

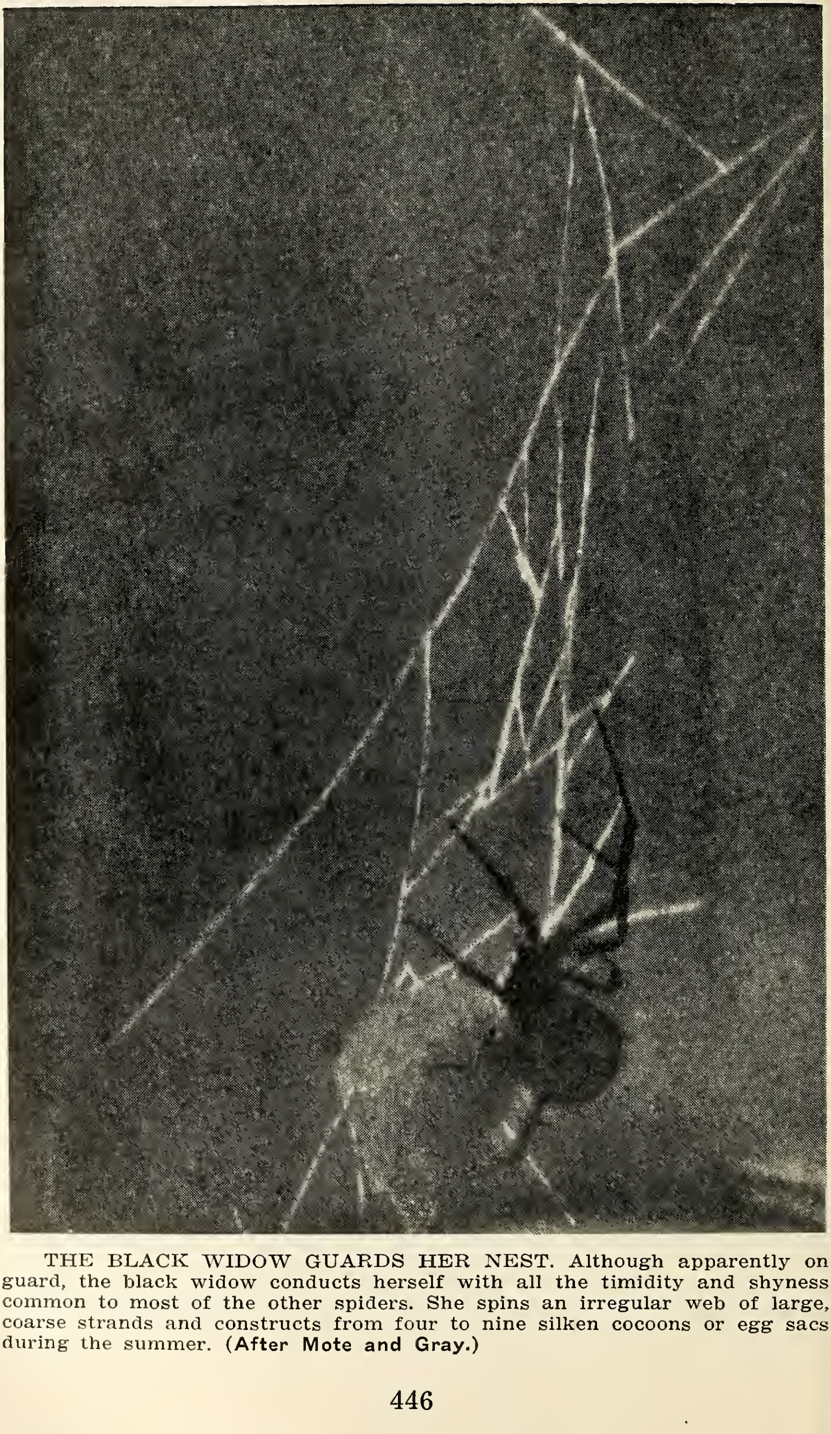
Definitely no information is here given as to the methods of artificially raising bullfrogs because, as must again be emphasized, all of the attempts to operate such frog farms that have come under the writer's immediate observation have ended in failure.

The capture of bullfrogs in the wild state is controlled by state regulations which involve, first, a closed season for the protection of bullfrogs during the breeding season, and, second, regulations covering the methods whereby frogs can be taken.

BLACK WIDOW SPIDER

The black widow spider, the only dangerously poisonous spider in the United States, still remains a subject of inquiry and cause for anxiety, particularly in New Orleans. Questions concerning its identification are being constantly asked and specimens are brought in at frequent intervals for examination. Some brief statement here concerning the appearance of this animal, the way to ascertain through the characteristics of its web its presence on human premises and the general methods of control is necessary.

The black widow (*Latrodectus mactans*) is a member of the so-called cobweb spiders, the Theridiiae. The black widow is closely related to the completely harmless common house spider (*Theridion tepidariorum*), and also to the harmless false black widow (*Steatoda borealis*).



THE BLACK WIDOW GUARDS HER NEST. Although apparently on guard, the black widow conducts herself with all the timidity and shyness common to most of the other spiders. She spins an irregular web of large, coarse strands and constructs from four to nine silken cocoons or egg sacs during the summer. **(After Mote and Gray.)**

The black widow gains its name from the female's habit of killing and eating the male after mating. This peculiar behavior is shared by many other spider species. Other popular names are shoe button spider, hourglass spider, Po-ko-moo (an Indian name) and poison spider.

Black widow females are the dangerous individuals, since the males, possibly because of smaller size and weaker mouth parts, have not been known to harm man.

The adult female black widow is unmistakable in appearance. Shiny black, with a highly globular and relatively large abdomen, she has rather long, slender black legs. The color pattern, although somewhat variable, is highly diagnostic. Typically there is present on the under surface of the abdomen a conspicuous bright scarlet hourglass, together with one or more circular scarlet spots in the neighborhood of the spinnerets. A variation frequently observed by the writers is the presence of a longitudinal row of three or four circular scarlet dots along the dorsal mid-line of the abdomen. Baerg reports the occurrence of completely black adult females lacking any trace of scarlet marking. The adult female black widow measures about half an inch from the tip of mouth parts to the tip of abdomen, but may, in normal standing posture, show a spread from front feet to hind feet of 2 to 3 inches.

The male black widow is about half the size of the female, and displays a much different coloration. Considerable variation occurs. A typical pattern shows three pairs of lateral, oblique yellow to golden bands on the upper surface of the abdomen, together with additional straw colored markings. The ventral scarlet hourglass is present. The legs are marked with alternate yellow and black.

The young female undergoes a series of transitional changes from a pattern resembling that of the male to the characteristic adult female design.

Unlike certain spiders, the black widow does not jump, but has relatively long legs and can run quite rapidly.

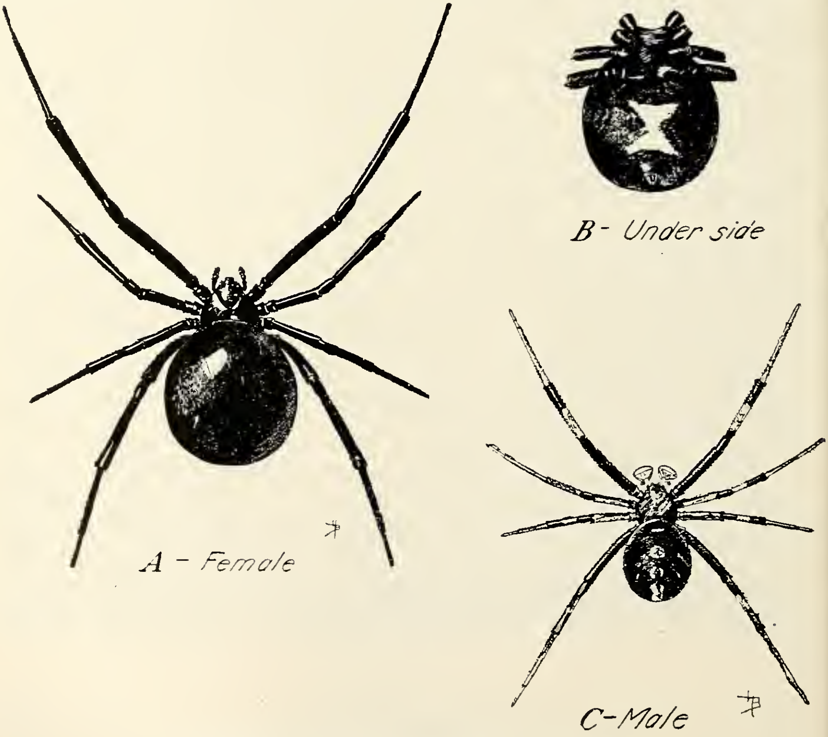
Web

The web of the black widow is distinctive and useful as an index of the presence of the species. Loosely woven and irregular so that scarcely two of the coarse strands lie in the same plane, the web is unusually strong. A simple test to distinguish between the web of the house spider and that of the black widow is to stroke a straw through the structure. The web, in the case of the house spider, will break without bending the straw, but in the case of the black widow the straw will bend or break before the web gives way. While usually rather small and in a sheltered place, their webs may often extend as much as 6 to 7 feet, and may be entirely in the open.

The black widow captures in its tough web the wide variety of insects and other animal life upon which it feeds.

Egg Cocoon

The black widow deposits 300 to 600 eggs each about one twenty-fifth of an inch in diameter, in a spherical or pyriform paperlike egg cocoon, whose external opaque silk surface may

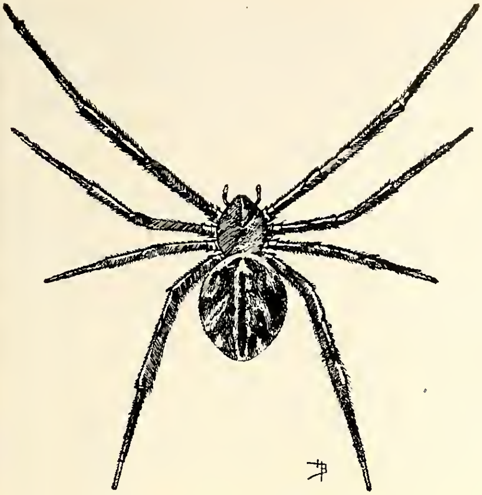


A - Female

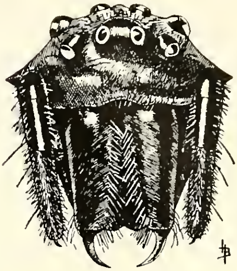
B - Under side

C - Male

For description see underlines on next page.



E-Immature female



D-Head of female
(Front view)

Figures A and B. Adult female dorsal and ventral views, the latter displaying the typical scarlet hourglass marking. This hourglass is variable in shape depending upon the condition of the abdomen, and may consist of a transverse rectangular bar (placed posteriorly) from the center of which rises an inverted triangle.

Figure C. Adult male. Note the pair of genital bulbs in front of the head.

Figure D. Front view of head of adult female. Note the sharp claws articulating on the basal segments of the chelicerae. Through these the venom is injected into the wound. Note the appearance of the eight eyes.

Figure E. Immature female. The pattern differs strikingly from the adult female since a scarlet band occurs along the mid-line of the back together with three pairs of lateral golden bars. As the female grows, this mid-line scarlet stripe breaks up into a row of circular scarlet spots. (After Circular E 345, U. S. Bureau of Entomology and Plant Quarantine)

vary from white to buff in color. The egg cocoons of most related spiders have no such opaque covering, and can be distinguished at a glance because the eggs themselves can be seen. The young emerge from this egg cocoon through a small aperture after an incubation period that has been given as three to four weeks.

The black widow haunts relatively dry situations. She is characteristically solitary, that is, one occupying each web. Webs may, however, be closely adjacent. If two adult female black widows are introduced into the same container, one will almost invariably kill and eat the other. The writer, however, found many instances in which the black widow was living closely adjacent to other spider species.

Typical occurrence around New Orleans is in cypress, stumps, accumulations of trash, piles of stones and paving blocks, under steps, in fencecorners, culverts, and in the burrows of animals. The black widow will also enter outbuildings, garages, the housings of service meters, sleeping porches and even occupied homes. Numerous specimens from all such situations have been received by the writer. The black widow is described as avoiding strong light, although the writer has observed specimens apparently at ease although fully exposed to noonday sunlight.

The black widow fortunately is not aggressive, although under certain circumstances if something vibrates her web she may rush excitedly to the object and bite violently at it. Experimentally controlled black widows are sometimes only with difficulty induced to bite material offered to them. Most instances of human bite are due to the spider being caught in clothing and irritated by pressure, to the presence of these spiders in beds, or to the disturbance of these spiders in outdoor toilets. The last category has been the cause of most reported cases of human injury.

The pain caused by the initial bite may be so slight that it may pass unnoticed. Usually, it is but the equivalent of two slight pin pricks. The colorless venom, which is a powerful neurotoxin, is extremely poisonous since in spite of its small quantity it may cause such serious results. It is evidently disseminated with considerable speed. The clinical evidence indicates a slower elimination of the venom than in the case of snake venom. The symptoms may develop within from ten minutes to several hours following the bite, and vary profoundly. The actual site of the bite usually reveals a small wheal, which is red or sometimes white and hard. Some itching and burning may be noted at the time. A frequent general symptom is the development of sharp pain sometimes radiating from the site of the wound and often spreading over the entire body. The pain may be so severe that the body of the patient becomes contorted because of its excruciating character.

Emergency treatment of black widow bite differs considerably from that of snake bite. Cutting and suction of the wound appear to be of little value since the venom spreads speedily, and, furthermore, cutting often results in serious secondary infections. Sterilization of the site of the wound with iodine solution is recommended by medical authorities. Applications of cloths soaked in a hot 50 per cent aqueous solution of ordinary epsom salts afford local relief. The patient should be kept quiet and, as in the case of snake bite, nothing whatever alcoholic should be given. Sedatives to relieve the pain may be administerd, although they are often surprisingly ineffective.

Control measures of the black widow are simple, available, and highly desirable. It is the opinion of the writer that they should consist of periodic inspection of premises to determine the presence of the spider. Three means of noting its presence are available: first, the distinctive color and appearance of the adult female; second, the distinct irregularity and unusual strength of the web; third, the paperlike, opaque, ovoid egg cocoon. When the presence of the spider is established, it should be searched for and destroyed, its egg sac located and burned.

The writer wishes again to emphasize that there is no need to become hysterically alarmed about the presence of this spider, but that there is every need to exercise reasonable precautions in reducing to a minimum the dangers of being bitten.

CARE AND REARING OF GOLDFISH

Goldfish inquiries are very numerous and fall into two groups: first, those regarding goldfish in captivity; and, second, those which concern the culture of goldfish as a commercial enterprise.

Goldfish in captivity break down into the exigencies which arise when the fish are maintained in small indoor aquaria or, as is particularly the case in New Orleans and other Louisiana cities, those which are held in ponds for ornamental purposes. In the latter case, highly severe financial losses can occur within a matter of a few days if preliminary signals of disaster are not noted. Repeatedly the writer has been called upon to advise in instances where several hundred such ornamental fish, valued at as much as $15 each, have died when easily, practical, effective treatment could have been applied. It is for this reason that the following brief statement concerning goldfish care is here included.

The chief cause of death among goldfish is undoubtedly overfeeding. As a rule the fish should be fed once a day in summer and once every two days in the wintertime. Various foods may be used, some of the pressed food obtainable in any pet store being especially desirable. Such foods that have a granular form and are composed usually of a mixture of flour, dried fish roe, dried meat or dried shrimp will be found to give excellent results. Ordinary dried shrimp pounded up is a good food. It is extremely important when this is used that the amount given be carefully adjusted so that no excess remains, since the subsequent putrefaction would seriously damage the goldfish. On a whole, it should be remembered that the goldfish require both meat and cereal in their diet. The meat may take in any of the forms indicated above (dried fish roe or dried shrimp, etc.), or may be given as straight fresh meat, finely chopped earthworms, or fresh or dried liver. When feeding fresh meat, beef heart will be found to be especially useful since it tends to stick together better. It should, of course, be finely chopped. Dried bread crumbs, especially wholewheat bread, is good for the cereal part of the goldfish's food.

Disease among goldfish is most frequently due to improper conditions—overcrowding, the decay of leftover food, etc. When disease appears in the form of fungus growth on the fins or skin of the fish, salt treatment is to be recommended. When the diseased region is not near the head, the affected part may be dipped in a 50 per cent solution of hydrogen peroxide, which will effectively sterilize it. Probably the best way of ridding the goldfish of parasites or of fungus is to place the affected fishes for a week or ten days in a solution of one-half ounce of common table salt to a gallon of water. This should be aerated by pouring it back and forth a number of times before the fish are placed in it and should be renewed every two or three days. Care must be taken, of course, so that sudden changes of temperature be avoided.

When new fish are introduced, they should be isolated and kept in quarantine for a week or ten days, since the introduction of new stock is the most common source of disease infection. If signs of disease appear, the fish should be treated with a solution of potassium permanganate made up roughly in the proportion of five small crystals to one quart of water. They may be allowed to remain in this bath for some fifteen minutes to a half hour and this treatment should be repeated at intervals for a period of several weeks, until all signs of the disease disappears.

Constant inquiries are received seeking details of goldfish pond structure. The Department is very glad to provide information not otherwise readily accessible which solves in simple terms some of the biological problems that arise when such pools are for breeding goldfish, holding goldfish for bait or holding other species of bait fish.

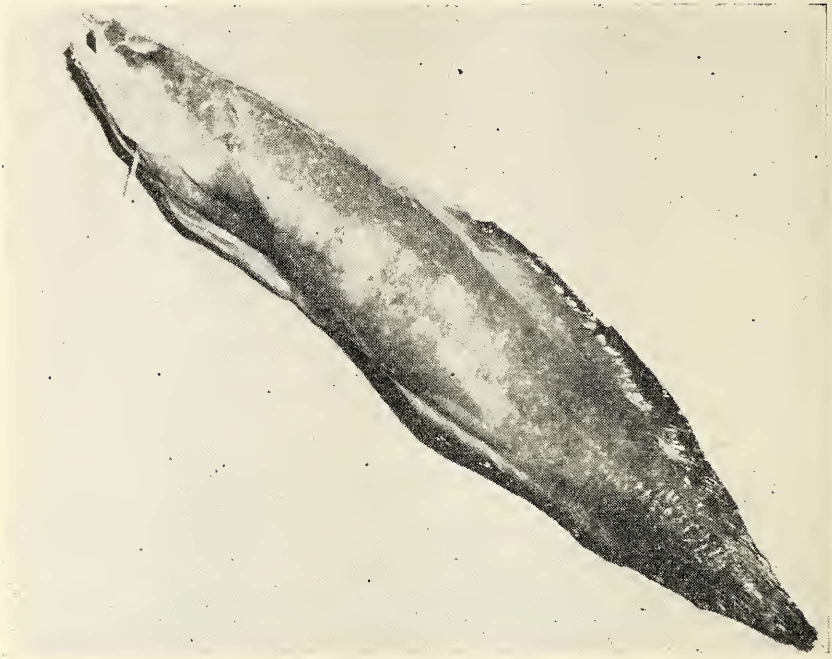
The facts are that under procedures of ordinary concrete construction, the acidity-alkalinity balance of the water becomes so extreme on the alkaline side through the leaching out of chemicals from the concrete that not only are the fish destroyed but even the water plants die. The same chain of events occurs with even more violence in the case of concrete tanks where there is no organic material present to aid in counteracting the adverse chemical changes. Technically expressed, the hydrogen ion concentration under ordinary circumstances of concrete use will rise above a value of pH nine plus, which is fatal for fish. Extremely simple, practical and inexpensive treatment has been discovered to prevent this damage and information concerning the technique that can be applied by anyone building such tanks or ponds will be gladly given on request.

TROPICAL FISH

Although the responsibilities of the Department of Wild Life and Fisheries do not include the provision of information concerning tropical fish problems, such inquiries are received in increasing numbers. The chief biologist is very glad to provide at any time references to authoritative and adequate consultative sources, particularly since the hobby of raising tropical fish is constantly growing in the deep south.

Occasionally in New Orleans and vicinity, reports are received by this Department of the sudden appearance of great numbers of "fleas" which under certain circumstances have invaded even second-floor bedrooms. So numerous are they that they can be swept up by the quart and another characteristic is that they never bite anyone.

The fact is that these alarming invasions are not caused by insects at all (which fleas are) but by small aquatic crustaces which form normally an important part in the food chain of our fresh water fishes. They are technically known as amphipods and the commonest kind usually involved is *Hyallela.* The combination of immense abundance of these amphipods plus a sudden fluctuation in water level may cause their entrance in vast numbers into structures near water. Once they are stranded, they become very active but are incapable of surviving. They are completely harmless.



BROTULA. This deep sea fish is an example of the many strange specimens brought in to the Biological Research Section. Belonging to a deep sea family and provided with peculiarly elongated dorsal and ventral fins and elongated sensory barbels, it exhibits typical adaptation to deep sea life. This unusual specimen measuring 11½ inches in length was caught by Mr. J. A. Treay, a sport fisherman, at Grand Isle. The technical name is Brotula barbata. (Photograph by Harry E. Schafer, Jr., of the Department of Wild Life and Fisheries).

BIOLOGICAL RESEARCH—GULF STATES MARINE FISHERIES COMMISSION

The Gulf of Mexico, which is approximately in area three-quarters of a million square miles, has been without doubt one of the most neglected areas of water in the world in point of biological exploration. Alexander Agassiz, son of the famous Louis Agassiz, financed and led the Hawk expedition, probably the most comprehensive of such investigations in the Gulf of Mexico. In terms of modern marine research ships, the *Hawk* was indeed a small vessel. The work that Alexander Agassiz accomplished, necessarily limited by operational equipment, did arouse great interest because of the unusual discoveries that were made. Strangely enough, this interest was not again translated into a rounded, systematic program until the passage of over half a century.

The systematic work of the cooperative shrimp investigations using, first, the *Black Mallard* of the Louisiana Department of Conservation (now the Louisiana Department of Wild Life and Fisheries) and, thereafter, the much larger sea-going ship, the *Pelican*, of the Federal Fish and Wildlife Service followed. For some years, the headquarters of these shrimp researches was located in the Louisiana Department of Conservation in the Civil Courts Building, New Orleans, and Louisiana made financial contributions together with Louisiana's scientific personnel for the conduct of this work. The writer served throughout those years as the scientific supervisor of Louisiana's contributions to this long range program.

Then came the creation of the Gulf States Marine Fisheries Commission. Never before had there existed any agency concerned with the mutual examinations of the scientific problems of administration, exploration and careful utilization of the marine resources of the five states bordering on the Gulf. Then the President of the United States signed the necessary implementing Congressional enactment.

The Gulf States Marine Fisheries Commission was organized pursuant to the provisions of Public Law No. 66 of the Eighty-first Congress of the United States, to promote the better untilization of the fisheries, marine, shell and anadromous, of the seaboard of the Gulf of Mexico, by the development of a joint program for the promotion and protection of such fisheries and the prevention of the physical waste of the fisheries from any cause. The states entering the compact were Florida, Alabama, Mississippi, Louisiana and Texas.

The compact was approved on May 19, 1949, and was ratified by the legislatures of the member states.

At the Commission's request, the Fish and Wildlife Service of the United States Department of the Interior was designated by Congressional enactment as the official investigative agency for the Gulf States Marine Fisheries Commission. The response by the Federal government has been superb. There have been detailed two excellent vessels, one the motor vessel *Oregon* for exploratory fishing, the other the motor vessel *Alaska* for biological research. This work coincides with imperative national defense in the production of food necessities.

The program of the researches has been most carefully considered. It represents the discussions of a state biologist, desig-

The OREGON. The exploratory fishing research vessel Oregon which with the companion vessel, the Alaska, also devoted to biological research is conducting a long range program of fisheries research in the Gulf of Mexico in relation with the Gulf States Marine Fisheries Commission. **(Photograph by Dr. Norman J. Haugland, courtesy Jefferson Parish Yearly Review.)**

nated by each of the five states, together with most fully given advice of the Federal scientists, the acting agency for the Gulf States Marine Fisheries Commission, the Fish and Wildlife Service, and full consultation with the leaders of the fisheries industries of these five states.

Never before had there existed an agency whereby at last the Gulf states could co-equally speak and thus fill in the last gap in the ring of the coastal United States, joining hands with the Atlantic Marine Fisheries Commission and the Pacific Marine Fisheries Commission. This is truly significant history.

The *Oregon* is testing out a wide variety of gear, including many types of fishing equipment not ordinarily operated in the Gulf. Two examples of these are, first, practical small size fish traps (these fish traps in no way interfere with sport fish) and, second, "long lines" (a "long line" is an extremely lengthy line provided with short baited side lines, all of which lie on the ocean bottom). The Gulf of Mexico possesses some peculiar characteristics that suggest the use of fish catching gear never before tried. In addition, the *Oregon* program involves the modification of known gear and the experimental invention and development of new types of gear to increase the commercial fisheries harvest.

Knowledge of currents is of primary importance. The former elaborate, expensive drift bottles are now replaced by colored, transparent plastic envelopes containing the cards. Unaffected by wind, they float and are readily recovered, and give a truer drift course.

Some understanding of the extent of the plan and (as far as the *Oregon* is concerned, already some months in progress) program for these researches may be gained by the following references from the report of the Gulf States Marine Fisheries Commission's committee to correlate research and exploratory fishing operations, of which the writer serves as chairman:

Long Range Program:

> Ascertain the normal oceanographic pattern of the Gulf throughout the year. This will include studies of currents, salinities, temperatures, nutrients, and their biological significance.

> Ascertain the distribution and relative abundance of fish eggs and larvae, and associated organisms through the year. This is to be directed toward an understanding of the adult stages of the fishes.
>
> Ascertain the nature of the Gulf bottom as related to fisheries.
>
> Short Range Program:
>
> Species to be given first consideration include shrimp (grooved), tuna, shark, snapper, and menhaden.

Mimeographed copies of each individual report are distributed by W. Dudley Gunn, secretary-treasurer of the Commission, to the commissioners and other interested officials, to one hundred and sixty-three newspapers in the Gulf States, to twenty-seven fishermen's unions and associations. The total number thus distributed is approximately two hundred and twenty-five. The purpose of this procedure is to make available as directly and quickly as possible new discoveries of economic importance.

As an example of Mr. Springer's reports, the abbreviated statement concerning Cruise No. 4 follows:

> "The *Oregon* trawled for shrimp, during the period September 11-26 (1950), in the area near the mouth of the Mississippi River between the 88th and the 91st meridians.
>
> "Observations on Grooved Shrimp:
>
> "Following a short period of strong winds at the beginning of September the bottom water temperatures in 30 to 50 fathoms were generally a few degrees lower than in the preceding period. The larger brown shrimp, *Penaeus aztecus,* 16 count heads-on, and larger, were found to be most abundant in 32 to 34 fathoms; that is, in water somewhat shallower than in the preceding period. The *Oregon* caught 12 to 16 count shrimp for eleven hours in 32 to 34 fathoms, about 15 miles west to west by south of Southwest Pass at the mouth of the Mississippi River, on the night of September 14th at a rate of 240 pounds per hour. The depth, distribution and size of the shrimp were apparently the same in the areas immediately east and west of the mouth of the river but in September the concentrations appeared to be greater west of the mouth.

"Comparatively little bottom suitable for trawling was found near the mouth of the Mississippi in depths from 50 to 150 fathoms. One drag of 45 minutes duration in 195 fathoms with a 40-foot shrimp trawl produced 60 pounds of 28 count, heads-on, red shrimp, *Hymenopeneus robustus,* along with 61 pounds of scrap.

"While a shrimp trawl was being pulled on deck from 258 fathoms on September 23rd, a school of tuna, not identified as to species, came to the surface around the *Oregon* briefly and sounded, accompanied or followed by silky sharks.

Gulf Exploratory Fishing Program

Since October 1950 explorations by the *Oregon* have been planned to give emphasis to work on brown grooved shrimp, *Penaeus aztecus.* In the course of this work it has been both convenient and profitable to carry on fishing for other kinds of shrimp and to make observations on fish and other marine animals of the Gulf of Mexico.

During the year the *Oregon* traveled approximately 15,000 miles and spent 141 days at sea. Two trips were made into the southern part of the Gulf, one in the winter to the north and east part of Campeche Bank and one in the late summer to the Gulf of Campeche. Aside from these two trips most of the work was carried on in depths of greater than 20 fathoms in areas bordering the five Gulf states.

In many of the areas covered, particularly along the Florida coast, looking for trawlable bottom consumed many days of each trip. Mud lumps, rocks, coral, loggerhead sponges and shell were the major trawling obstacles encountered. A winter of unusually bad weather greatly reduced the number of days when trawling could be carried out without continual destruction of gear.

BROWN GROOVED SHRIMP—The concentration of exploratory effort has been on *Penaeus aztecus.* To date results indicate an unbroken stock of this species from off Pensacola, Florida, across the north Gulf down to south Texas. Moderate concentrations of this species were found off Carmen, Mexico, in depths of 20 to 30 fathoms. Heaviest stocks found to date have been located in areas where there is a narrowing of the continental shelf

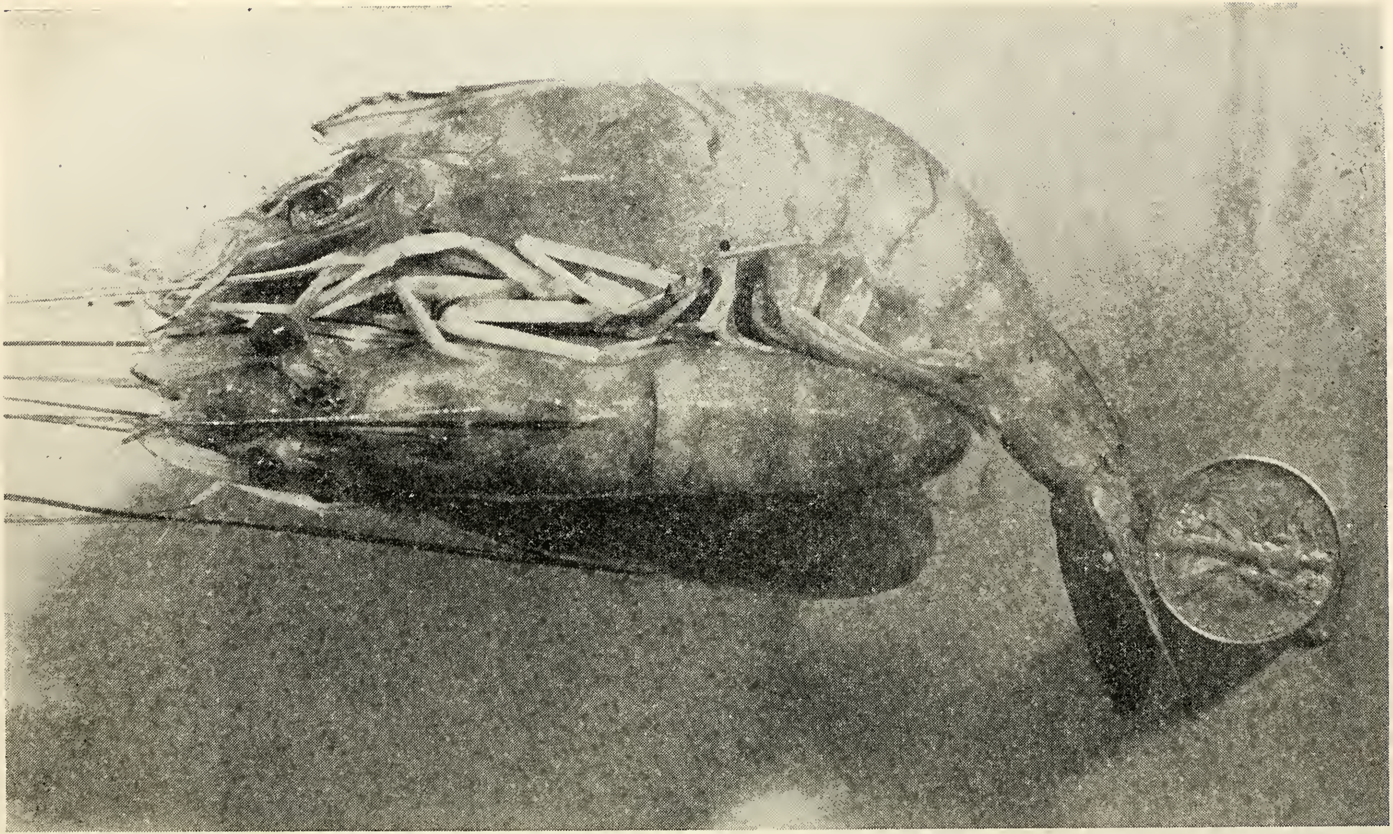
Mending Shrimp Trawl. Exploratory fishing over unknown bottom areas is a hazardous operation. Here shown aboard the exploratory fishing vessel "Oregon" is the never-ending task of net mending. **(Photograph by Dr. Norman J. Haugland, courtesy "Jefferson Parish Yearly Review.")**

and it is in these areas where the brown shrimp fishery is working at the present time. Between Aransas Pass and Pensacola brown shrimp have been taken in depths of from 19 to 65 fathoms. Between 25 and 50 fathoms they have been taken in every drag, although in varying amounts. Beyond the 50 fathom curve several small concentrations of very large shrimp (up to 3 per pound) were found off Pensacola and along the Texas coast. General information on size, sex ratios, and catch percentage have been recorded.

PINK GROOVED SHRIMP—The *Oregon* has, in the past year, surveyed the areas of the present fishery for pink grooved shrimp, *Penaeus duorarum,* and has attempted to extend the range of the fishing grounds. Following up several reports that pink shrimp are abundant all along the Florida West Coast several areas between Cape San Blas and Key West have been trawled. To date poor bottom conditions have prevented extensive exploration. Several experimental trawls, designed to overcome bottom obstacles, have been constructed. Preliminary tests comparing these trawls to conventional styles have been underway for several months. One design, the bottomless trawl, has proved to eliminate up to 95% of the loggerhead sponges. With this trawl perfected it is hoped that a much more intensive survey of potential pink shrimp beds can be carried out.

While exploring the areas surrounding the Campeche pink shrimp fishery the *Oregon* extended the grounds then being worked approximately 40 miles to the northwest. Throughout this area the bottomless trawl eliminated from 75 to 100 per cent of bottom trash such as coral, sponges, and shell.

RED SHRIMP—The *Oregon,* in exploratory drags made in deeper water, has found one other kind of shrimp in sufficient quantity to be of commercial interest. This is the red shrimp, *Hymenopeneus robustus.* This species has been found continuously between Aransas Pass and St. Petersburg in depths between 190 and 240 fathoms. Both 40 foot try nets and 100 foot commercial nets have been used to establish range and abundance of the red shrimp. Investigations of the extent of the stocks are being continued by the *Oregon.* Other kinds of shrimp have been taken in deep drags, but thus far none except the red shrimp have been found in sufficient quantities to be of commercial interest.

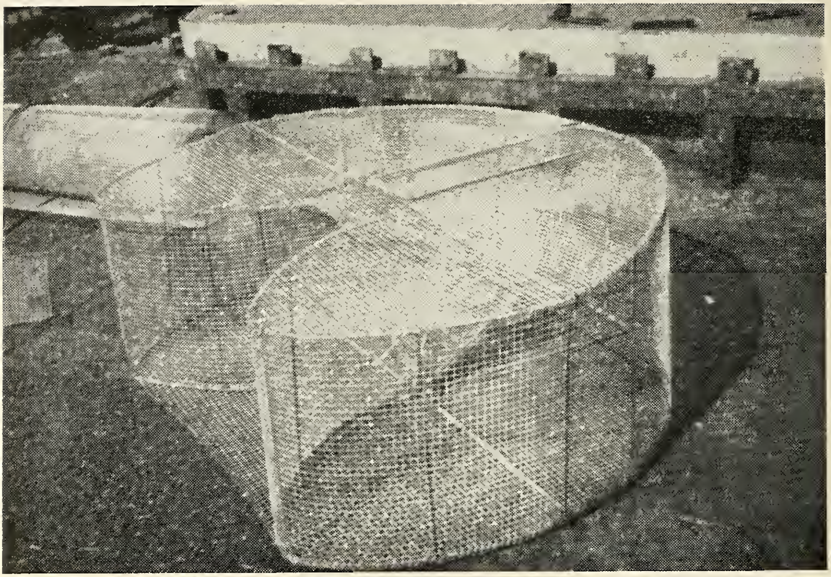


These three specimens of "Lake Shrimp" or "White Shrimp" (**Penaeus setiferus**) scaled with a fifty cents piece indicate the size attained by this basic species of the Louisiana shrimp fishery, which constitutes the greatest fishery of the Deep South. **Photograph by Randon Picture Service, courtesy Jefferson Parish Yearly Review.)**

Valuable tuna and red snappers are among the fish here shown captured off Louisiana in the course of the "long line" experimental fishing conducted by the research vessel "Oregon." **(Photograph by Dr. Norman J. Haugland, courtesy "Jefferson Parish Yearly Review.")**

TUNA—No active tuna work has been undertaken to date. All observations have been logged and charted. Several scattered schools of tunalike fishes have been observed during the past year, however, it wasn't until September that the *Oregon* was actually able to obtain specimens from observed schools. The species proved to be *Parathunnus atlanticus,* the Atlantic blackfin or bigeye tuna. Extensive schools of these fish were observed east and southeast of South Pass of the Mississippi River early in September. Throughout the past year trolling lines have been run from the *Oregon* during daylight hours while the vessel was underway. In early August a blackfin tuna weighing 15 pounds was taken in this manner about 75 miles north of Alcaran Reef, and though several other trolling rigs were hit and broken at the same time no surface fish were observed.

RED SNAPPER—One trip, in May and June, was devoted primarily to red snapper exploration. During this trip 11 trap sets were made and handlines or electric reels were tried in 28 areas. In addition, during the course of each trip, likely looking areas were fished and uncharted lumps recorded. Since time lost in



Red Snapper Trap—Among the many types of new gear used in the exploratory fishing researches of the vessel Oregon is this heart-shaped Red Snapper trap, successfully tested. (Photograph by Dr. Norman J. Haugland, courtesy Jefferson Parish Yearly Review.)

the location of the best fishing spots is a considerable factor in the reduction of productivity per unit of effort, the use of Loran receiving equipment is being studied to learn whether it can effect important savings in time.

OTHER WORK—Experimentation with midwater trawls was carried out during August and September. A series of 13 drags of different sized trawls were made from two chartered shrimp boats. Additional midwater trawls of different sizes have been constructed for further testing during the coming year.

When, as never before since Valley Forge, has this nation been in greater peril, there is the additional imperative need for the production of food. It is also significant that the Gulf of Mexico can probably be better protected from prowling enemy snorkels than our Atlantic and Pacific Coasts.

BIRD MIGRATION

The biennial reports of the Louisiana Department of Wild Life and Fisheries and earlier reports of its predecessor, the

Louisiana Department of Conservation, are in constant use as reference works in many fields. No group in the animal world exerts the peculiar and almost universal appeal that birds do.

A number of times before in the biennial reports in the history of this Department and its predecessor, attempts have been made to provide in some compact and organized manner an authentic survey of information regarding especially the kinds of birds that have been scientifically accepted as occurring in Louisiana, the times of year during which they have been found in Louisiana and accurate information as to whether they breed in Louisiana. These earlier projects, some of which were presented in the form of brief "Check Lists," although always inadequate and incomplete were eagerly read. Such ornithological information is of basic value because of the wide demand for it, which is indicated by the constant requests received by the chief biologist for specific detailed data regarding members of almost every family of wild birds that occur in our state.

The cooperation of Dr. George H. Lowery, Jr., eminent ornithologist of Louisiana, has made possible the presentation here for the first time in print anywhere of precisely such a summary of information on the occurrence of birds in Louisiana.

Dr. Lowery of Louisiana State University has been an internationally known research worker in the fields of both ornithology and mammalogy for over the last two decades. Dr. Lowery in April, 1951, first assembled and presented this table in mimeographed form. He very kindly permitted its use as a reference record and further brought it up to current date so that for the first time persons seeking this information can have easy access to it.

Since the biennial report of the Department of Wild Life and Fisheries goes not only to the members of the Legislature but to the educational institutions of the state at various levels and to educational and various scientific institutions as well as to libraries throughout the state and elsewhere where it is usually preserved as a permanent record, the presentation of this will serve a wide and highly valuable purpose.

It is obvious that to compress such a vast amount of information into such a small space a standard procedure must be followed. The following statement by Dr. Lowery indicates clearly how this table should be used:

LOUISIANA STATE UNIVERSITY

MUSEUM OF ZOOLOGY

5 April 1951

The following graphs represent a summary of all available data, up to January, 1951, pertaining to the seasonal occurrence of the birds of Louisiana. A careful attempt has been made to show for each species the months of the year in which there are actual records, as well as extreme dates of arrival and departure. When the examination of the literature and of specimens and records in this museum failed to produce a record for any particular month for any given species, then that month was left blank on the graph, regardless of the weight of presumptive evidence pointing to the occurrence of the species in the state in that month. For example, even though we found records of the occurrence of the white ibis in every month except February, we did not presume that the species was here in that month also. The same rigid policy was followed in checking breeding status. If there was no record of a nest or other proof of actual breeding but at the same time little or no doubt that the species in question breeds within the state, then the column "B.A." ("breeding assumed"), as contrasted with "breeding known," was checked. The mere occurrence of a species in the state in the breeding season is generally regarded as wholly inadequate evidence of actual nesting.

We hope when you are aware of the species of which nests need to be found, you will make an effort to find some of these and thereby help us eliminate gaps in the graph. As you will note, some common summer birds still remain to be confirmed as nesters.

The "Baton Rouge region" embraces the parishes of East and West Baton Rouge, East and West Feliciana, and Pointe Coupee. This is the general area worked by ornithologists residing in Baton Rouge and St. Francisville. It is the only inland area of the state for which there are reasonably complete data covering many years of observation by a number of ornithologists. Since the study of birds in this area has been rather intensive, the extreme dates of arrival and departure there are actually in many instances over-all state records.

This material is being sent to you for your use. To know when a species has previously been recorded in an area is often of great assistance in correct field identification. Since the extreme dates of arrival and departure are based on many years of research and study by many people, from Audubon's time to the present, one should scrutinize especially closely any bird whose occurrence extends any date herein shown. In the event that you establish a new record, please be sure to send us a data slip giving the particulars of the record. Samples of our data slips are enclosed herewith. A conventional 3 x 5 card can be used if you do not have at hand one of our regular slips, By continuing to assemble here a master file of records pertaining to Louisiana birds, it will be possible to keep this summary of occurrence up to date and to issue to you from time to time revised summaries such as the one hereto attached.

GEORGE H. LOWERY, JR.

	LOUISIANA														BATON ROUGE REGION													
	B.A.	B.K.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	B.A.	B.K.
Common loon			××	××	××	××	××	5				18	××	××	××	4								22	××	××		
Red throated loon														23-30												23-30		
Holboell grebe														2														
Horned grebe			××	××	20							22	××	××	××	××	20								8	××		
Eared grebe														28														
Least grebe														14												14		
Pied-billed grebe	†	†	××	××	××	××	××	××	××	××	×××	××	××	××	××	××	××	××	××	××	××	××	×××	××	××	××	†	†
Wilson petrel								8	26																			
White pelican			××	××	××	××	××	××	××	××	×××	××	××	××	××	××	××	××	25					30	××	××		
Brown pelican	†	†	××	××	××	××	××	××	××	××	×××	××	××	××	11							××						
Blue-faced booby									28																			
White-bellied booby			××			××					××																	
Red-footed booby													1															
Gannet														9														
Double-crested cormorant	†	†	××	××	××	××	××	××	××	××	×××	××	××	××	××	××	××	××	××	××	××	××	×××	××	××	××		
Mexican cormorant	†	†	××	××	××	××	××	××				××	××	××														
Water turkey	†	†	××		××	××	××	××	××	××	×××	××	××	××				4	××	××	××	××	×××	××	30		†	
Man-o'-war bird					25	××	××	××	××	××	×××	28										6–11						
Great blue heron	†	†	××	××	××	××	××	××	××	××	×××	××	××	××	××	××	××	××	××	××	××	××	×××	××	××	××	†	
American egret	†	†	××	××	××	××	××	××	××	××	×××	××	××	××	××	××	××	××	××	××	××	××	×××	××	××	××	†	†
Snowy egret	†	†	××	××	××	××	××	××	××	××	×××	××	××	××			17	××	××	××	××	××	×××	××	30		†	†
Reddish egret			××						××	××	×××		××	××														
Louisiana heron	†	†	××	××	××	××	××	××	××	××	×××	××	××	××					7	××	××	××	×××	××	13			
Little blue heron	†	†	××	××	××	××	××	××	××	××	×××	××	××	××			9	××	××	××	××	××	×××	25		××	†	†
Green heron	†	†	××	××	××	××	××	××	××	××	×××	××	××	××			14	××	××	××	××	××	×××	17			†	†
Black-crowned night heron	†	†	××	××	××	××	××	××	××	××	×××	××	××	××	4	××	××	××	××	××	××	××	×××	××	12		†	
Yellow-crowned night heron	†	†	××	××	××	××	××	××	××	××	×××	××		××			27	××	××	××	××	××	8				†	†

	LOUISIANA														BATON ROUGE REGION													
	B.A.	B.K.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	B.A.	B.K.
American bittern	†	†	××	××	××	××	××	××		××	×××	××	××	××	××	××	××	××	××	××			×××	××	××	××	†	
Least bittern	†	†			11	××	××	××	××	××	15			××				8	××	××	××	8					†	†
Wood ibis			××			××		××		××	×××	××	××	××			24	15				8	28					
Eastern glossy ibis									23				17															
White-faced glossy ibis	†	†	××	××	××	××	××	××	××	××	×××	××	××	××														
White ibis	†	†	××		××	××	××	××	××	××	×××	××	××	××				24	××	××	××	××	×××	7				
Scarlet ibis									3												3							
Roseate spoonbill	†	†			××	××	××	××	××	××	×××			××														
Flamingo														6														
Whistling swan			15	××									30	××														
Trumpeter swan			××										××															
Canada goose			××	××	25							12	××	××										7–29				
Hutchins goose			1										××															
White-fronted goose			××	××	××	6						16	××	××			27							29-31				
Snow goose			××	××	××	29					7	××	××	××										3	12			
Blue goose			××	××	××	××	18				7	××	××	××			19							3	12			
Ross goose				23																								
Fulvous tree duck	†	†	××			××	××		××	××	×××	××	××	××														
Mallard			××	××	××	××	6				7	××	××	××	××	22								20	××	××		
Black duck			××	××	11							7	××	××	××	××	7								11	××		
Mottled duck	†	†	××	××	××	××	××	××	××	××	×××	××	××	××														
Gadwall			××	××	××	××	8			25	×××	××	××	××	××	××	××	3						5	××	××		
American pintail			××	××	××	××	13				1	××	××	××	××	××	××	3						5	××	××		
Green-winged teal			××	××	××	22					15	××	××	××	××	××	××	13						24	××	××		
Blue-winged teal	†	†	××	××	××	××	××	××		××	×××	××	××	××	××	××	××	××	13			20	×××	××	24			
Cinnamon teal			15									20	××	××														
Baldpate			××	××	××	××	30				11	××	××	××	××	××	××	3						16	××	××		

	LOUISIANA														BATON ROUGE REGION													
	B.A.	B.K.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	B.A.	B.K.
Shoveller			XX	XX	XX	29					8	XX	XX	XX	XX	XX	24							11	XX	XX		
Wood duck	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	†	
Redhead			XX	XX	XX	20	XX	XX	XX	XX	XXX	3	XX	XX	XX	XX	XX	17						30	XX	XX		
Ring-necked duck			XX	XX	XX	27			XX			3	XX	XX	XX	XX	XX	27			XX			3	XX	XX		
Canvasback			XX	XX	XX	3							5	XX	XX	XX	XX	3							8	XX		
Greater scaup duck			XX		8								2	XX			8								4	XX		
Lesser scaup duck			XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XX	XX	23	XX	XX	XX	XX	XX	XXX	1	XX	XX		
American goldeneye			XX	XX	13									5	XX	XX	8									16		
Bufflehead			XX	XX	20								1	XX	XX	XX	20								21	XX		
Old squaw			XX	XX	XX	XX	3						15	XX	XX	XX	8								15	XX		
Harlequin duck						1																						
White-winged scoter					1									XX														
Surf scoter					20									4														
American scoter						15							11															
Ruddy duck			XX	XX	XX	XX	12					14	XX	XX	XX	XX	XX	XX	12					24	XX	XX		
Masked duck														23														
Hooded merganser	†	†	XX	XX	XX	XX	XX	XX					XX	XX	XX	XX			XX	XX					XX	XX	†	†
American merganser			XX	XX	XX	XX	XX	3				24	XX	XX														
Red-breasted merganser			XX	XX	XX	XX	30					25	XX	XX	XX		XX		20						9	XX		
Turkey vulture	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	†	†
Black vulture	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	†	†
White-tailed kite												11	2															
Swallow-tailed kite	†	†			5	XX	XX	XX			3						8	XX	XX	4			3					
Mississippi kite	†	†				4	XX	XX	XX	XX	XXX	XX	XX	2				4	XX	XX	XX	XX	XXX	XX	30		†	
Sharp-shinned hawk	†		XX	XX	XX	XX	XX	XX		XX	XXX	XX	XX	XX	XX	XX	XX	XX						XX	XX	XX	†	
Cooper hawk	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	†	†
Red-tailed hawk	†		XX	XX	XX	XX	XX	XX	XX		XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX		XXX	XX	XX	XX	†	
Harlan hawk			XX		28								26	XX	7										26	XX		

	LOUISIANA														BATON ROUGE REGION													
	B.A.	B.K.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	B.A.	B.K.
Red-shouldered hawk	†	†	××	××	××	××	××	××	××	××	×××	××	××	××	××	××	××	××	××	××	××	××	×××	××	××	××	†	†
Broad-winged hawk	†	†		7	16	××	××	××	××	××	×××	××	8			7	16	××	××	××	××	××	×××	14			†	†
Sennett White-tailed hawk													18															
American Rough-legged			××	××	××	12							2	××	××	××	18									12		
Ferruginous hawk			14												14													
Harris hawk												××												××				
Golden egale			××	14								8	××															
Bald eagle	†	†	××	××	××	××			××		×××	××	××	××	××	××	××	××					×××	××	××	××	†	†
Marsh hawk			××	××	××	××	25				2	××	××	××	××	××	××	25					2	××	××	××		
Osprey	†	†		××		××	××	××	××	××	×××	××	××					21	17		16	××	×××	××	12			
Audubon caracara	†	†	××		8			10						10														
Duck hawk	†	†	××	××	××	××	8				9	××	××	××	××								9	××	××	××		
Pigeon hawk			××	××	××	××	2				14	××	××	××	××		23						14	××	××	××		
Sparrow hawk	†	†	××	××	××	××	××	××	××	××	×××	××	××	××	××	××	××	××	××	××	××	××	×××	××	××	××	†	
Bobwhite	†	†	××	××	××	××	××	××	××	××	×××	××	××	××	××	××	××	××	××	××	××	××	×××	××	××	××	†	†
Turkey	†	†	××	××	××	××	××	××	××	××	×××	××	××	××														
Whooping crane	?		××	××	11								23	××														
Sandhill crane			××	××	××		××		××					××														
King rail	†	†	××	××	××	××	××	××	××	××	×××	××	××	××	××	××	××	××	××	××		××	×××	××	××	××	†	†
Clapper rail	†	†	××	××	××	××	××	××	××	××		××	××	××														
Virginia rail			××	××	××	××	9					30	××	××	2										25	××		
Sora			××	××	××	××	24			1	×××	××	××	××	××	××	××	27					3	××	××	××		
Yellow rail			××	××	××	××	1					21	××	××										21	××	21		
Black rail						1							9															
Purple gallinule	†	†	××	××	××	6	××	××	××	××	×××	10	××	××				17	××	××	××	××	×××	10		××	†	†
Florida gallinule	†	†	××	××	××	××	××	××	××		×××	××	××	××	××	11	××	××	××	××	××			5	××	××	†	†
American coot	?		××	××	××	××	××	××	××	××	×××	××	××	××	××	××	××	××	××	××	××	××	×××	××	××	××	?	
American Oyster catcher	†					28	××	11																				

	LOUISIANA														BATON ROUGE REGION													
	B.A.	B.K.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	B.A.	B.K.
Semipalmated plover			XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	4			22	17			7		XX	30			
Piping plover			XX		XX	XX	XX	XX		8	XXX	XX	XX	XX								8	12					
Snowy plover			XX	XX	XX	29				5	XXX	XX	XX	XX														
Wilson plover	†	†	XX		XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX														
Killdeer	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	†	†
American golden plover					8	30						14	XX	6			8	22										
Black-bellied plover			XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX									22	XX	2			
Ruddy turnstone			XX	XX	XX	XX	XX	XX		XX	XXX	XX	XX	XX								7	19					
American woodcock	†	†	XX	XX	XX	XX	XX	XX	XX			XX	XX	XX	XX	XX	XX	XX	1					12	XX	XX	†	†
Wilson snipe			XX	XX	XX	XX	XX	18		19	XXX	XX	XX	XX	XX	XX	XX	22						10	XX	XX		
Long-billed curlew			XX		XX	XX		XX	XX	XX	XXX	XX	XX	XX														
Hudsonian curlew					XX	XX	30		XX		XXX	XX		XX														
Eskimo curlew					16	10																						
Upland plover					3	26				5–31							3	12				5–25						
Spotted sandpiper			XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	18		22	XX	XXX	XX	XX	XX		
Solitary sandpiper			XX	XX	XX	XX	XX	24	21	XX	XXX	XX	XX	XX	XX	XX	XX	XX	11		22	XX	XXX	4		XX		
Willet	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX								7						
Greater yellow-legs			XX	XX	XX	XX	30		20	XX	XXX	XX	XX	XX			8	XX	16			24	XXX	XX	6			
Lesser yellow-legs			XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX			9	XX	16		31	XX	XXX	24				
American knot			XX		XX	XX	XX	12			3	XX	XX	XX									18					
Pectoral sandpiper				XX	XX	XX	27		17	XX	XXX	XX	XX	XX			11	10			31	XX	XXX	XX	6			
White-rumpped sandpiper					16	XX	31										16	XX	17									
Baird sandpiper						XX	16				14	XX	9						16				14	XX	9			
Least sandpiper			XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	18		15	XX	XXX	XX	XX	XX		
Redback sandpiper			XX	XX	XX	XX	XX	6				5	XX	XX										25	19			
Dowitcher			XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX									15					
Stilt sandpiper						2	16		27	XX	XXX	7										7	19					

	LOUISIANA														BATON ROUGE REGION													
	B.A.	B.K.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	B.A.	B.K.
Semipalmated sandpiper			××	××		××	××	××	××	××	×××	××	××	××					12		28	××	×××	××	××	××		
Western sandpiper			××	××	××	××	××	××	××	××	×××	××	××	××	××				15			7	×××	××	××	××		
Buff-breasted sandpiper						5	15			1	24											1	24					
Marbled godwit						4	31			16	×××	××	××	20														
Hudsonian godwit						22					6–27																	
Sanderling			××	××	××	××	××	××	××	××	×××	××	××	××									19	29				
Avocet						16 29						5	××	23										5	19			
Black-necked stilt	†	†	××		××	××	××	××	××	××	×××	××	××	××														
Wilson phalarope						29	10				12												12					
Red phalarope												12												12				
Herring gull			××	××	××	××	××	20				27	××	××	××	××	××		2						14	××		
Ring-billed gull			××	××	××	××	××	10		11	×××	××	××	××	××	××	××	5				11	×××	××	××	××		
Laughing gull	†	†	××	××	××	××	××	××	××	××	×××	××	××	××								6	18					
Franklin gull			29										3	××	29										3			
Bonaparte gull			××	××	××	7						8	××	××	××		20							8	××	××		
Gull-billed tern	†	†	××	××	××	××	××	××	××		×××	××	××	××														
Forster tern	†	†	××	××	××	××	××	××	××	××	×××	××	××	××	××	××	25				23	××		××	××	××		
Common tern			××	××	11	××	××	28			18	××	××	××	××	××	11							16				
Roseate tern				××																								
Sooty tern	†	†						5	3																			
Least tern	†	†	××	××	××	××	××	××	××	××	×××	××	××	××					4	××	××	××	24				†	†
Royal tern	†	†	××	××	××	××	××	××	××	××	×××	××	××	××														
Cabot tern	†	†	××	××	××	××	××	××	××	××	×××	××	××	××														
Caspian tern	†	†	××	××	××	××	××	××	××	××	×××	××	××	××	××	××	19		21			7	×××	16				
Black tern						20	××	××	××	××	×××	××	××	6				20	××	7		6	×××	9				
Noddy	?									30																		
Black skimmer	†	†	××		××	××	××	××	××	××	×××	××	××	××									20					

	LOUISIANA														BATON ROUGE REGION													
	B.A.	B.K.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	B.A.	B.K.
Rock dove	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	†	†
White-winged dove						12	XX			XX		31	XX	XX														
Mourning dove	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	†	†
Ground dove	†		XX	XX	XX	XX	XX	XX	XX			XX	XX	XX			15		XX		1			17	XX		†	
Inca dove						25							19	28														
Yellow-billed cuckoo	†	†			31	XX	XX	XX	XX	XX	XXX	XX	16					1	XX	XX	XX	XX	XXX	XX	16		†	†
Black-billed cuckoo						11	20			24	XXX	18						21	8			24	XXX	18				
Road runner	†	†			XX	XX	XX	XX	XX			13																
Smooth-billed ani			XX	XX					XX																			
Groove-billed ani				XX		23						7	XX	XX														
Barn owl	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	†	†
Screech owl	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	†	†
Flamulated owl			2												2													
Great horned owl	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	†	
Snowy owl*																												
HornNHawk owl																												
Burrowing owl			XX	XX	29							7	XX	XX	XX		18								10	XX		
Barred owl	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	†	†
Long-eared owl								18						22														
Short-eared owl			XX	XX	XX	XX	21					30	XX	XX				3						30	XX			
Saw-whet owl														XX														
Chuckwill's-widow	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX			27	XX	XX	XX	XX	XX	25				†	†
Whippoorwill	?		XX	XX	XX	XX	XX	XX	XX			XX			XX		27	7						11				
Nighthawk	†	†			18	XX	XX	XX	XX	XX	XXX	XX	28					10	XX	XX	XX	XX	XXX	28			†	†
Texas Nighthawk						23-11																						
Chimney swift	†	†			15	XX	XX	XX	XX	XX	XXX	XX	8				16	XX	XX	XX	XX	XX	XXX	XX	8		†	†
Vaux swift			XX	XX	3							14	XX	XX	XX	XX	3							14	XX	XX		

	LOUISIANA														BATON ROUGE REGION													
	B.A.	B.K.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	B.A.	B.K.
Ruby-throated hummingbird	†	†	XX		11	XX	XX	XX	XX	XX	XXX	XX	6		XX		11	XX	XX	XX	XX	XX	XXX	XX	6		†	†
Rufous hummingbird			4	6											19	6												
Belted kingfisher	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	†	†
Yellow-shafted flicker	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	†	†
Pileated woodpecker	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	†	
Red-bellied woodpecker	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	†	†
Red-headed woodpecker	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	†	†
Yellow-bellied sapsucker			XX	XX	XX	11					27	XX	XX	XX	XX	XX	XX	6					27	XX	XX	XX		
Hairy woodpecker	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	†	†
Downy woodpecker	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	†	†
Red-cockaded woodpecker	†	†	XX	XX	XX	XX	XX	XX		XX	XXX	XX	XX	XX														
Ivory-billed woodpecker	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX														
Eastern kingbird	†	†			18	XX	XX	XX	XX	XX	XXX	28					18	XX	XX	XX	XX	XX	XXX	28			†	†
Arkansas kingbird						4	21		19	XX	XXX	XX	1										0	28 –				
Gray kingbird							11																					
Scissor-tailed flyycatcher	†	†	4		25	XX	XX	XX	XX	XX	XXX	XX	XX	XX										1– 27				
Derbyflycatcher							23																					
Crested flycatcher	†	†			12	XX	XX	XX	XX	XX	XXX	19					25	XX	XX	XX	XX	XX	XXX	19			†	†
Ash-throated flycatcher			XX		20									23			20									23		
Easternphoebe			XX	XX	XX	XX	5				25	XX	XX	XX	XX	XX	XX	1						1	XX	XX		
Yellow-bellied flycatcher						26	12				2	22						26				17	XXX	22				
Acadian flycatcher	†	†				8	XX	XX	XX	XX	XXX	XX	1					11	XX	XX	XX	XX	XXX	19			†	†
Traill flycatcher						7	2			17	XXX	22						26					12	12				
Least flycatcher					30	XX	9		25		2	23											15	5				
Wood pewee	†	†			27	XX	XX	XX	XX	XX	XXX	XX	9					1	XX	XX	XX	XX	XXX	XX	9		†	†
Olive-sided flycatcher							6			16	19												7–19					
Vermilion flycatcher			XX	XX	5							19	XX	XX	XX	XX	3							19	XX	XX		

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	B.A.	B.K.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	B.A.	B.K.
Horned lark	?	....	6	22	....	10	....	....	....	....	......	....	....	....	28	....	....	....	....	....	....	....	......	....	....	....	....	....
Tree swallow	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XX	XX	XX	....	15	22	17	XX	XXX	XX	XX	XX	....	....
Bank swallow	....	....	....	....	23	XX	19	....	6	XX	XXX	10	....	....	....	....	....	12	18	....	18	XX	XXX	10	....	....	....	....
Rough-winged swallow	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	†	†
Barn swallow	†	†	....	....	15	XX	XX	XX	XX	XX	XXX	XX	28	....	....	....	20	XX	18	25	....	5	XXX	XX	28	....	....	....
Cilff swallow	....	....	....	....	....	15	XX	12	....	2	XXX	XX	1	....	....	....	....	15	3	....	....	19	XXX	18	....	....	....	....
Purple martin	†	†	23	XX	XX	XX	XX	XX	XX	XX	XXX	22	....	....	23	XX	XX	XX	XX	XX	XX	XX	XXX	9	....	....	†	†
Blue jay	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	†	†
Common crow	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	†	†
Fish crow	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	†	†
Carolina chickadee	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	†	†
Tufted titmouse	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	†	†
White-breasted nuthatch	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	....	XX	....	XX	....	XX	XX	....	......	....	....	....	†	....
Red-breasted nuthatch	....	....	XX	XX	XX	20	....	....	....	....	......	20	XX	XX	XX	XX	XX	20	XX	XX	XX	XX	XXX	20	XX	XX	....	....
Brown-headed nuthatch	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	†	†
Brown creeper	....	....	XX	XX	XX	12	....	....	....	....	......	20	XX	XX	XX	XX	XX	1	XX	XX	XX	XX	XXX	20	XX	XX	....	....
House wren	....	....	XX	XX	XX	XX	9	....	....	....	7	XX	XX	XX	XX	XX	XX	19	....	....	....	....	7	XX	XX	XX	....	....
Winter wren	....	....	XX	XX	XX	23	....	....	....	....	......	8	XX	XX	XX	XX	XX	4	....	....	....	....	......	17	XX	XX	....	....
Bewick wren	....	....	XX	XX	29	....	....	....	....	?	XXX	XX	XX	XX	XX	XX	29	....	....	....	....	....	26	XX	XX	XX	....	....
Carolina wren	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	†	†
Long-billed marsh wren	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XX	XX	XX	27	....	....	....	....	19	XX	XX	XX	....	....
Short-billed marsh wren	....	....	XX	XX	XX	XX	12	....	....	....	......	2	XX	XX	XX	XX	XX	10	....	....	....	....	......	2	XX	XX	....	....
Mockingbird	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	†	†
Catbird	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	†	†
Brown thrasher	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	†	†
Sage thrasher	....	....	2	....	....	....	....	....	....	....	......	....	....	....	....	....	....	....	....	....	....	....	......	....	....	....	....	....
American robin	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	†	†
Wood thrush	†	†	....	....	10	XX	XX	XX	XX	XX	XXX	XX	18	....	....	....	18	XX	XX	XX	XX	XX	XXX	XX	18	....	†	†

	LOUISIANA														BATON ROUGE REGION													
	B.A.	B.K.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	B.A.	B.K.
Hermit thrush			××	××	××	××	15				26	××	××	××	××	××	××	21						23	××	××		
Olive-backed thrush						5	21				12	××	16					20	19				12	13				
Gray-cheeked thrush						20	13				25	12						22	16				26	13				
Veery						8	××	4			12	27						20	19				14-27					
Eastern bluebird	†	†	××	××	××	××	××	××	××	××	×××	××	××	××	××	××	××	××	××	××	××	××	×××	××	××	××	†	†
Greenland wheatear											12																	
Blue-gray gnatcatcher	†	†	××	××	××	××	××	××	××	××	×××	××	××	××	××	××	××	××	××	××	××	××	×××	××	××	××	†	†
Golden-crowned kinglet			××	××	××	24						15	××	××	××	××	××	10						15	××	××		
Ruby-crowned kinglet			××	××	××	××	5				29	××	××	××	××	××	××	××	5				29	××	××	××		
Water pipit			××	××	××	××	2					10	××	××	××	××	××	12						26	××	××		
Sprague pipit			××	××	××	14							3	××														
Cedar waxwing			××	××	××	××	××	18			27	××	××	××	××	××	××	××	21						25	××		
Loggerheaded shrike	†	†	××	××	××	××	××	××	××	××	×××	××	××	××	××	××	××	××	××	××	××	××	×××	××	××	××	†	†
European starling	†	†	××	××	××	××	××	××	××	××	×××	××	××	××	××	××	××	××	××	××	××	××	×××	××	××	××	†	†
White-eyed vireo	†	†	××	××	××	××	××	××	××	××	×××	××	××	××	××	××	××	××	××	××	××	××	×××	××	××	××	†	†
Bell vireo	†	†			31	××	2	××	4																			
Yellow-throated vireo	†			10	2	××	××	××	××	××	×××	25				10	13	××	××	××	××	××	×××	25			†	
Solitary vireo			××	××	××	××	4			1		5	××	××	××	××	××	19						5	××	××		
Red-eyed vireo	†	†			15	××	××	××	××	××	×××	31					22	××	××	××	××	××	×××	26			†	†
Philadelphia vireo						26- 30				2	×××	31							13			24	×××	26				
Warbling vireo	†	†			4	××	××	××	××	××	×××	3					26	××	××	××	××	××	×××	3			†	†
Black-and-White warbler	†	†		27	××	××	××	××	××	××	×××	××	××	23			11	××	××	××	××	××	×××	××	29		†	?
Prothonotary warbler	†	†			5	××	××	××	××	××	×××	15					5	××	××	××	××	××	×××	15			†	†
Swainson warbler	†	†			30	××	××	××	××	××	×××	3					30	××	××	××	××	××	×××	3			†	†
Worm-eating warbler	†	†			14	××	××	××	××	××	×××	12					14	××	××	××	××	××	×××	12			†	†
Golden-winged warbler						6	10			15	×××	21						17	2			15	×××	21				
Blue-winged warbler	?				22	××	20			4	×××	14					30	××	20			4	×××	14				

	LOUISIANA														BATON ROUGE REGION													
	B.A.	B.K.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	B.A.	B.K.
Bachman warbler	†			27	××	××	9																					
Tennessee warbler					12	××	16				9	××	17					6	16				9	31				
Orange-crowned warbler			××	××	××	××	1					17	××	××	××	××	××	30							7	××		
Nashville warbler						2	10					31		××										25		19		
Parula warbler	†	†		××	××	××	××	××	××	××	×××	××	××	××			2	××	××	××	××	××	×××	25		22	†	†
Yellow warbler			××		××	××	××	××	××	××	×××	××	××	××			11	1	16	16	24	××	×××	20		3		
Magnolia warbler					21	××	21				8	××	7					16	17				8	××	7			
Cape May warbler						21	15																					
Black-throated blue warbler					22	27						20												14-20				
Myrtle warbler			××	××	××	××	15			5	×××	××	××	××	××	××	××	29				5		7	××	××		
Black-throat gray warbler														22														
Black-throat green warbler					30	××	22			12	×××	××	22					29	11				11	30				
Crulean warbler	†				27	××	××	××	××	××	×××	18					31	××	1		22	××	20					
Blackburnian warbler					27	××	29				7	16						26	2				9	16				
Yellow-throated warbler	†	†		27	××	××	××	××	××	××	×××	19					7	××	××	××	××	××	×××	18			†	†
Chestnut-sided warbler					21	××	22			27	×××	××	1					6	17			27	×××	25				
Bay-breasted warbler						17	20				27	××	15					17	17					8	15			
Black-poll warbler						20	13											25	13									
Pine warbler	†	†	××	××	××	××	××	××	××	××	×××	××	××	××	××	××	××	××	××	××	××	××	×××	××	××	××	†	†
Prairie warbler	†	†			5	××	××	××	××	××	×××	17					25	××	××	××	××	30					†	†
Palm warbler			××	××	××	22						6	××	××	××	××	××	8						9	××	××		
Ovenbird					28	××	17			9	×××	××	13					15	16			25	×××	17				
Norhtern water thrush						6	16		20	××	×××	25						16	16			15	×××	24				
Louisiana water thrush	†	†			14	××	××	××	××	××	×××	25					14	17		××	8	××	×××	25			†	
Kentucky warbler	†	†			14	××	××	××	××	××	×××	25					19	××	××	××	××	××	×××	16			†	†
Connecticut warbler						22						9																
Mourning warbler						2	2			13	×××	18											15	18				

	LOUISIANA														BATON ROUGE REGION													
	B.A.	B.K.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	B.A.	B.K.
Yellow throat	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	†	†
Yellow-breasted chat	†	†	24			4	XX	XX	XX	XX	XXX	XX		XX				10	XX	XX	XX	XX	XXX	22		26		
Hooded warbler	†	†			8	XX	XX	XX	XX	XX	XXX	31					15	XX	XX	XX	XX	XX	XXX	26			†	†
Pileolated warbler				XX		16	26				11	XX	XX	24									11	24		XX		
Canada warbler						5	22			13	XXX	17	4?				29	17			13	XX	X 17	4?				
American redstart	†	†			28	XX	XX	XX	XX	XX	XXX	XX	7					7	XX	XX	XX	XX	XXX	XX	7		†	†
English sparrow	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	†	†
Bobolink						1	XX	XX	13	4	XXX	3						19	23					3				
Eastern meadowlark	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	†	†
Western meadowlark			XX	11										9	XX	11										9		
Yellow-headed blackbird			22																									
Eastern Redwing	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	†	†
Orchard Oriole	†	†			14	XX	XX	XX	XX	XX	XXX	25					14	XX	XX	XX	XX	XX	XXX	25			†	†
Baltimore oriole	†	†	XX		30	XX	XX	XX	XX	XX	XXX	XX	28				30	XX	XX	XX	XX	XX	XXX	3			†	†
Bullock oriole				1																								
Rusty blackbird			XX	XX	XX	XX	10						17	XX	XX	XX	XX	1							28	XX		
Brewer blackbird			XX	XX	XX	17							12	XX	XX	XX	XX	14							12	XX		
Boat-tailed grackle	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	7													
Purple grackle	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	†	†
Brown-headed cowbird	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	†	†
Western tanager					19	XX	11																					
Scarlet tanager						3	31			31	XXX	14						16	13			31	XXX	14				
Summer tanager	†	†			26	XX	XX	XX	XX	XX	XXX	29					26	XX	XX	XX	XX	XX	XXX	24			†	†
Cardinal	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	†	†
Rose-breasted grosbeak						15	16				24	XX	XX	28				21	16				24	25		28		
Blue grosbeak	†	†		XX		11	XX	XX	XX	XX	XXX	XX	XX	20				15	14			4	XXX	XX	XX	20	†	
Indigo bunting	†	†			XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX			XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	†	†
Painted bunting	†	†	XX		XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX				7	XX	XX	XX	XX	XXX	23			†	†

	LOUISIANA														BATON ROUGE REGION													
	B.A.	B.K.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct	Nov	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug	Sept.	Oct.	Nov.	Dec.	B.A.	B.K.
Dickcissel	†	†				6	XX	XX	XX	XX	XXX	XX	15	XX				15	XX	XX	XX	XX	XXX		15		†	†
Purplefinch			XX	XX	XX	25							25	XX	XX	XX	28								25	XX		
Pine siskin			20		31																							
Eastern goldfinch	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	8						13	XX		
Red crossbill					27																							
Red-eyed towhee	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	†	†
Spotted towhee														23														
Savannah sparrow			XX	XX	XX	XX	XX	15			23	XX	XX	XX	XX	XX	XX	XX	14					7	XX	XX		
Grasshopper sparrow	?		XX	XX	XX	XX	XX	18				3	XX	XX	XX	XX	XX	XX	XX	18				3	XX	XX	?	
Lecount sparrow			XX	XX	XX	10						17	XX	XX	XX	XX	XX	10						31	XX	XX		
Hensloe sparrow			XX	XX	XX	XX	15					24	XX	XX	XX	XX	4							24	XX	XX		
Sharp-tailed sparrow			XX	XX		XX	XX	7				24	XX	XX														
Seaside sparrow	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX														
Vesper sparrow			XX	XX	XX	30				5		XX	XX	XX	XX	XX	26							18	XX	XX		
Lark sparrow	†	†	XX	XX		XX	XX	XX	XX	XX	XXX	XX	XX	XX				13				24	18			XX		
Pine-woods sparrow	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX		XX	XXX		XX	XX	†	†
Slate-colored junco			XX	XX	XX	25						10	XX	XX	XX	XX	29								8	XX		
Tree sparrow				11-16																								
Chipping sparrow	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	†	†
Field sparrow	†	†	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XXX	XX	XX	XX	†	†
Harris sparrow			XX		19									XX														
White-crowned sparrow			XX		XX	XX	12					XX	XX			XX	27							28				
Golden-crowned sparrow						20																						
White-throated sparrow			XX	XX	XX	XX	30				28	XX	XX	XX	XX	XX	XX	XX	6				28	XX	XX	XX		
Fox sparrow			XX	XX	XX	6							1	XX	XX	XX	19								14	XX		
Lincoln sparrow			XX	XX	XX	XX	30					21	XX	XX	XX	XX	XX	11							8	XX		
Swamp sparrow			XX	XX	XX	XX	13				26	XX	XX	XX	XX	XX	XX	XX	5					10	XX	XX		
Song sparrow			XX	XX	XX	30			5			6	XX	XX	XX	XX	27				5			23	XX	XX		
Lapland longspur			XX	14									12	XX	3	4												
Snow bunting‡																												

*Three undated records prior to 1900, one at Baton Rouge. **Dubious record winter 1886. ‡Taken at Covington—date unknown.

The Eastern and Western worlds converge on the office of Commissioner Ernest S. Clements, of the Department of Wild Life and Fisheries, and learn about Louisiana's Mallard ducks, a specimen of which Commissioner Clements holds for demonstration. Left to right they are: Horacio Rosa, Jr., of Sao Paulo, Brazil, fisheries biologist of the fisheries division of the food and agriculture organization of the United Nations; Pedro Morales, head of the bureau of Fisheries of the Philippines; Commissioner Clements, and Dr. Felisberto Monteiro, head of the fisheries department of the state of Sao Paulo, Brazil. International authorities seek advice from the Louisiana Department of Wild Life and Fisheries. Dr. Rosa now has his headquarters at the United Nations Food and Agricultural Organization in Rome, Italy **(Photograph by Edouard Morgan of the Department of Wild Life and Fisheries.)**

WORLD HELP

The chief biologist has also been concerned with cooperation in the international program of the United Nations, the purpose of which is to enable many countries to supplement their protein nutritional assets and cut down their needs for aid from the United States and other members of the United Nations. The situation is that many of these countries, in some of which thousands of persons yearly actually die of starvation, do have native resources, the use of which is neglected. It happens that some of these lands, such as Pakistan, India, Indonesia and certain areas of the Philippines, involve fisheries' problems greatly similar in nature to those of Louisiana. This is because of similarities of species of shellfish and finfish and general similarities of climatic conditions. The chief biologist has been active in cooperating with these programs since it has been the desire of the commissioner to cooperate as usefully as possible with the programs whose ultimate direction is to contribute to world peace by meeting dire needs in strategic countries. It happens that the director of the entire Food and Agricultural Administration of the United Nations is a former student many years ago and associate of the chief biologist.

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